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A REVIEW OF THE
CEPHALOPOD FAMILY SEPIIDAE

BY
WILLIAM ADAM (BRUXELLES)
and
WILLIAM J. REES (LONDON)



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WILLIAM ADAM AND WILLIAM J. REES



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I. INTRODUCTION

THIS review of the cephalopod family Sepiidae was begun by the authors in 1947 and for various reasons was laid aside until 1961 when it was decided to complete the work.

During 1947 the senior author visited the British Museum (Natural History) to study its rich type collections¹ and it was then decided to undertake a joint report on the interesting collection of Sepiidae brought back by the John Murray Expedition to the Indian Ocean in 1933-1934.

We had the opportunity to compare these and other species with the types described by John Edward Gray in 1849. Most of Gray's types were still in fairly good condition but had never been described in detail or figured and for this reason had always remained doubtful species or had been subsequently misidentified. It was therefore decided to re-describe Gray's Sepiidae and also some South African forms which had been confused by several authors.

The completion of this study was delayed but it was arranged in 1961 for the senior author to visit London so that the task could be resumed and at the same time the scope of the report was enlarged to include all the Sepiidae in the collections of the British Museum, with the exception of West African and European species; the Sepiidae of these two areas being already sufficiently known.

Even though these collections are rich in species, most of the Japanese and Australian forms are lacking so that it is not yet possible to present a complete monograph of the whole family. The Japanese species have been well described in Sasaki's monograph (1929) but the Australian forms, most of which were described by Iredale (1926, 1940, 1954, 1955) only from cuttle-bones are very imperfectly known.

Nevertheless it seems advisable to give a critical revision of all recent Sepiidae hitherto described.

The authors wish to thank Dr F. C. Fraser and Mr N. Tebble for facilitating much of our work and Mr H. O. Ricketts for his kind and valuable assistance. For material, information and photographs of species, thanks are due to: Dr K. H. Barnard (South African Museum, Cape Town), Mr B. C. Cotton (South Australian Museum, Adelaide), Professor J. H. Day (University of Cape Town), Dr W. S. S. van der Feen-van Benthem Jutting (Zoological Museum, Amsterdam), Professor E. Fischer-Piette (National Museum of Natural History, Paris), Dr J. Knudsen (Zoological Museum, Copenhagen), Dr D. F. McMichael (Australian Museum, Sydney), Miss V. Orr (Academy of Natural Sciences, Philadelphia), Dr H. A. Rehder (Smithsonian Institution, Washington), Dr H. Steinitz (Hebrew University, Jerusalem) and Dr G. L. Voss (University of Miami). Most of the photographs illustrating this review have been skilfully produced by the Photographic Section of the Museum, the majority being taken by Mr J. V. Brown and Mr P. J. Green.

In addition the senior author wishes to acknowledge a grant from the Trustees of the British Museum to enable him to visit London in 1961 to re-examine all the material.

The conclusions reached on the status of the different species have been jointly agreed by both authors, but the junior author would like to express his indebtedness to Dr Adam for drafting this report. The preparation of this final draft for the press and the assembly of the plates has been done in London by the junior author.

Both authors are deeply conscious of the inadequacy of our knowledge of the living animals of the genus *Sepia*. The best known is of course *Sepia officinalis*, which, besides being the type species of

¹ This visit was supported by a grant from the Belgian "Fonds National de la Recherche Scientifique" for which the senior author expresses his sincere gratitude.

the genus, is also a teaching type in European Universities and has been used for many experimental and behavioural studies. Of the remaining species, only in less than half a dozen do we know anything about general biology, physiology and reproduction. For these reasons we are, as we have said, very conscious of great gaps in our knowledge of the Sepiidae. Nevertheless we believe that this survey, including as it does a re-assessment of John Edward Gray's early material and of the Challenger Sepiidae, together with the John Murray Expedition's collections as well as other specimens in the British Museum, will go a long way towards establishing how many species there are—and not least it does not attempt to hide the serious deficiencies in our knowledge of the Australian Sepiidae.

II. ABBREVIATIONS

A.L. I	length of dorsal arms (measured from the first proximal sucker to the distal arm tip).	L.M.	length of mantle.
		Loc.	locality.
		m	metre.
		mm	millimetre.
A.L. II	length of dorso-lateral arms.	M.L.d.	dorsal length of mantle.
A.L. III	length of ventro-lateral arms.	M.L.v.	ventral length of mantle.
A.L. IV	length of ventral arms.	M.N.H.N.P.	Muséum National d'Histoire Naturelle (Paris).
B.M.	British Museum.		
f.	fathoms.	M.W.	width of mantle.
F.L.	length of fins.	s.	sand.
fms.	fathoms.	S.a.	diameter of arm suckers.
F.W.	width of fins.	sh.	shell.
ft.	feet.	sp.	specimen.
gn.m.	green mud.	S.t.	diameter of tentacular suckers.
H.L.	length of head.	Str.z.	length of striated zone.
H.W.	width of head.	T.cl	length of tentacular club.
I.R.S.N.	Institut royal des Sciences naturelles (Brussels).	Th.	thickness.
		T.L.	total length of tentacle.
juv.	juvenile.	W.	width.
L.	length.	W.P.	width of protuberance.
L.loc.	last loculus.		

III. DESCRIPTION OF SPECIES

1. *Sepia thurstoni* sp. nov. (Pl. 1, figs. 1-4; pl. 41, fig. 235)

Sepia rouxii Hoyle, 1904a, p. 198 (*non* Férussac & d'Orbigny).
Sepia rostrata (pars) Winckworth, 1936, p. 16 (*non* Férussac & d'Orbigny).
Sepia sp. Adam, 1939, p. 80, pl. III, figs. 1 & 2.

TYPE LOCALITY: Ramesvaram Island, Madras.

GEOGRAPHICAL DISTRIBUTION: Madras; off Negombo and Hambantota, Ceylon.

MATERIAL:

a. Ramesvaram Island, Madras (Coll. Thurston); B.M. 1894.9.6. 2-4: 1 ♂ (holotype).

- b. off Negombo, Ceylon, 12-20 fms., 31. i. 1902; bottom, coarse yellow sand; B.M. 1947.5.5.36; 1 ♀ (paratype; det. Hoyle, 1904 as *Sepia rouxii*).
- c. Hambantota, Ceylon, 16.xii.1926 (Coll. Winckworth, Mus. roy. Hist. nat. de Belgique); 2 shells (paratypes).

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♂	84	95	52	25	43	—	14	54
b	♀	74	91	50	26	43	—	15	38

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♂	84	48	49	64	138	22.5	1.7	1.1
b	♀	74	38	37	46	100	20	1.6	1.0

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
a	♂	80	39	10.6	69	3.8	pl. 1, figs. 1 & 2
b	♀	73	37	7.3	67	3.4	pl. 1, figs. 3 & 4
c	—	105.5	39	8.1	77	4.3	
	—	63	39.5	7.1	59	5.5	

DESCRIPTION: The male specimen, labelled "*Sepia indica*", is in a good state of preservation. It has a short, rather broad body. The dorsal surface of head, arms and mantle is of a fairly uniform, faintly transversely-striated, blue-black colour (in spirit) with densely crowded chromatophores. The latter are much less dense on the fins and on the ventral side so that the ground colour of the skin is not obscured.

The mantle is widest in the middle of the body and tapers bluntly posteriorly. Its ventral margin is only slightly emarginate, but dorsally it is emarginate behind the eyes, and projects forward in the median line to midway between the eyes. The fins are well developed and fleshy; they reach to within 3 mm of the mantle margin and extend posteriorly beyond the mantle tip.

The head is as wide as the mantle opening. The eyes are large and the bluntly-conical funnel reaches nearly to the angle between the ventral arms.

All the arms are laterally compressed; the dorsal ones are rounded at their bases and faintly keeled near their tips. The dorso-lateral arms are also faintly keeled, the keel descending to the ventral margin of the outer side. The ventro-lateral arms are still more strongly keeled and the ventral ones possess strong swimming-membranes on the outer sides of their ventral surfaces. All the arms possess well-developed protective membranes.

The web is rudimentary between the dorsal and dorso-lateral arms; it reaches the third and fourth rows of suckers between the lateral arms and the fifth row of suckers between the ventro-lateral and ventral arms; it is absent between the ventral arms.

The left ventral arm is hectocotylied: the first five rows of proximal suckers are of normal size, followed by seven rows of reduced suckers in the basal half of the arm. The inner and outer rows of suckers of the dorsal side are abruptly reduced to vestiges of widely separated suckers, each with

a diameter of 0.6 mm, but the ventral inner and outer rows are less reduced. Of these ventral suckers the first three are almost of normal size, while the remainder are slightly smaller. Beyond the middle of the arm the suckers become normally quadriserial as on the other arms.

The tentacular stem is triangular in cross-section, with a blunt keel. The club has a well-developed swimming-membrane in the middle of the dorsal side; it is not continuous with the outer keel of the stem and is slightly longer than the club (pl. 41, fig. 235). The protective membranes are rather narrow; they remain separated at the base of the club and continue down the stem as faint ridges. The subequal suckers are arranged in eight longitudinal series.

The female paratype, which had been identified by Hoyle (1904, p. 198) as *Sepia rouxii*, is smaller and has a paler appearance. The ventral part of its buccal membrane is widely expanded and shows two spermathecae very distinctly.

The shell of the male is oval, flattish, rounded at both ends, with a rounded spine directed upwards. (pl. 1, figs. 1 & 2). The convex dorsal surface has a low median rib and two very faint lateral ribs. The surface is finely granular corresponding to the growth lines. The chitinous marginal zones are narrow.

The ventral surface has a broad median depression extending to the posterior border of the last loculus, the latter being slightly convex. The striated area is separated from the outer cone by two nearly smooth, slightly-striated, lateral zones.

The striae of the striated area are slightly convex in the posterior part, becoming more and more pronounced towards the last loculus.

The inner cone is hollow, its posterior part forming a wide, thick, slightly convex border. Its broad lateral limbs are completely fused with the outer cone. The latter is well developed in the posterior half of the shell, surrounding the inner cone.

The shell of the female is slightly narrower and flatter and the ventral median depression is shallower (pl. 1, figs. 3 & 4). In both sexes the posterior part of the dorsal surface is smooth and shiny, but does not seem covered by a glaze-like substance.

REMARKS AND RELATIONSHIPS: Our new species somewhat resembles *Sepia brevimana* but in this species the tentacular club is different. The shell of the latter species is acuminate, especially at the anterior end; the posterior portion of the inner cone is much less developed and the median ventral groove much shallower in the male. The dorsal surface of the shell of *S. brevimana*, especially of the male, is distinctly different in having flattened areas between the ribs which are covered with tubercles.

The tentacular club of *S. thurstoni* is similar to that of *S. lycidas*, but the shell of the latter differs, in the absence of smooth zones between the striated area and the outer cone, in that the limbs of the inner cone are narrow and raised without being fused to the same extent with the outer cone and in the glaze-like covering of the posterior part of the dorsal surface.

The shell of *S. thurstoni* shows a great resemblance to that of *S. zanzibarica*, but the former has a flatter ventral surface and the limbs of the inner cone much broader, whereas the spine has no lateral expansions at its base.

The tentacular club of *S. zanzibarica* differs in its unequal suckers, the median ones being distinctly larger than the marginal ones.

Adam (1939c, p. 80) pointed out that his *Sepia* sp. from Hambantota, which we refer to *S. thurstoni*, strongly resembled some poorly preserved shells from Madagascar. In fact these later shells belong to *S. zanzibarica*.

Finally, the shell of *S. thurstoni* shows some resemblance to that of *S. aculeata*, especially as regards the posterior portion of the inner cone, but its fused limbs are much wider and instead of being convex as in *S. aculeata* the striated area shows a deep groove.

2. *Sepia brevimana* Steenstrup, 1875
(Pl. 2, figs. 5-8)

Sepia brevimana Steenstrup, 1875, pp. 475, 497; 1881, pl. I, figs. 24-26; 1962, pp. 93, 106, pl. I, figs. 24-26; Tryon, 1879, p. 197; Hoyle, 1886, pp. 22, 130, 133, 139, 218; Adam, 1939c, pp. 72, 81, 88; Adam, 1965, p. 172, pl. 30, figs. 1-3.
Sepia rostrata (pars) Férussac & d'Orbigny, 1848, p. 284, pl. 26 (*non* 1835, pl. 8); Winckworth, 1936, p. 16.
Acanthosepion rostratum, Rochebrune, 1884, p. 102, pl. 6, fig. 1; Adam, 1944, p. 230.
Sepia winckworthi Adam, 1939a, p. 1, fig. 1, pl. I; 1939c, p. 79, pl. III, figs. 7-9.
Acanthosepion spinigerum (pars) Rochebrune, 1884, p. 103; Adam, 1944, p. 230.

TYPE LOCALITIES: Indian Ocean (*S. brevimana*); Singapore (*S. winckworthi*).

GEOGRAPHICAL DISTRIBUTION: Indian Ocean; Java Sea.

MATERIAL:

- a. Sarawak (Santubong and Buntal) (Coll. Bartlett); B.M. 1894.7.14.10; 1 shell.
- b. Andaman Islands; B.M. 1907.8.30.189-190; 2 shells.
- c. Madras, 23.x.1927; B.M. 1952.11.24.56-58; 3 shells.
- d. Hambantota, 16.xii.1926; B.M. 1952.11.24.62-64; 3 shells.
- e. Madras, 1.iv.1930; B.M. 1952.11.24.65-66; 2 shells.
- f. Singapore, May, 1933; B.M. 1952.11.24.67; 1 shell.
- g. Mannar, 30.xii.1924; B.M. 1952.11.24.68-71; 4 shells.
- h. Puri, 22.iv.1929; 15.iii.1929; 30.v.1929; B.M. 1952.11.24.72-74; 3 shells.
- i. Madras, 18.ix.1930; B.M. 1952.11.24.75-76; 2 shells.
- j. Puri, 22.iv.1929; B.M. 1952.11.24.77; 1 shell.
- k. Juhu, 4.xi.1928; B.M. 1952.11.24.78; 1 shell.
- l. Madras, 6.vi.1924, B.M. 1952.11.24.94-95; 2 shells (anterior portion damaged).
- m. Port Blair, ii.1937; B.M. 1952.11.24.130; 1 shell.

With the exception of the first two localities (*a* and *b*), all the remaining material is from the Winckworth collection and was identified by him as *Sepia rostrata*.

MEASUREMENTS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
c	?♂	78	41	7.7	71	4.5	
c	?♂	78	37	9.0	67	5.1	
e	?♂	76	36	7.9	71	5.3	
h	?♂	76	41	7.9	74	5.9	
m	?♂	75	41	8.0	72	6.0	
c	?♂	72	39	9.0	63	6.3	pl. 2, figs. 5 & 6
j	?♂	50	43	9.6	56	8.0	
k	?♂	42	43	7.4	64	8.3	
h	?♂	33	50	9.7	51	8.8	
d	?♀	111	35	7.7	78	3.6	
d	?♀	77	41	7.1	74	3.2	
i	?♀	69	38	8.3	70	8.7	
i	?♀	67	40	8.5	69	7.5	
f	?♀	65	40	7.7	71	6.2	pl. 2, figs. 7 & 8
e	?♀	64	39	8.3	66	8.6	
a	?♀	60	43	8.3	72	7.5	
d	?♀	52	41	8.6	63	2.9	
g	?♀	52	39	8.7	62	4.8	
g	?♀	44	41	9.1	64	5.7	
h	?♀	40	42	7.5	58	10.0	

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
<i>g</i>	? ♀	36	43	8.3	61	5.6	
<i>g</i>	? ♀	34	44	8.5	65	5.9	
<i>b</i>	?	53	38	7.7	—	6.6	
<i>b</i>	?	32	44	7.8	59	7.8	

DESCRIPTION: The collections of the British Museum do not contain a single animal of this species. The animal was described as *S. winckworthi* by Adam (1939, p. 4), who received it from Winckworth after the shell had been removed.¹ This specimen is a female from Singapore (May, 1933). Among the above-mentioned shells from the Winckworth collection is a single shell from the same locality (*f*) which probably belongs to this female specimen; it is a little longer than the animal (57 mm) but this may be due to contraction of the latter in spirit.

The mantle is broad; its ventral margin is slightly concave and its dorsal margin is acuminate and projects strongly. The posterior end is also very acuminate due to the long spine of the shell.

The fins begin a few millimetres behind the mantle-margin beyond which they do not project anteriorly.

The arms are subequal and do not attain half the mantle-length. Their swimming-membranes and protective membranes are only slightly developed. The suckers are quadriserial.

The tentacular club is short (19%) with a well developed swimming-membrane extending beyond the base of the club; there is a narrow, ventral, protective membrane and a wide, dorsal, protective membrane, attaining in the middle half the width of the sucker-bearing surface.

In the middle of the club the small subequal suckers seem to be arranged in five longitudinal series, but perhaps form oblique transverse rows of eight.

This small animal (L=57 mm) was sexually mature, the nidamentary glands were well developed and the ovary was filled with eggs.

In his original description Adam (1939a, p. 5) described two types of shells which he considered to be male and female ones. This hypothesis is substantiated by the fact that the shell from Singapore (*f*) probably belongs to the female type specimen.

The shell of the male has a very flat median part with a narrow central rib. The whole dorsal surface is tuberculate and presents three, longitudinal series of stronger tubercles, one in the median line and two extending from the posterior end to the lateral angles of the acuminate, angular, anterior portion (this character which is very distinct in the original illustration, is not visible in the male shell figured on pl. 2, fig. 5).

The ventral surface is rather flat with a very shallow median groove. The striated zone is separated from the outer cone by two broad smooth areas, the striae being weakly rounded. The inner cone is rose-coloured and has broad lateral limbs which are nearly completely fused to the outer cone and to the smooth marginal areas. The posterior part of the inner cone forms a rounded, ventral ledge with a flat, thick, anterior rim. The outer cone is acuminate at its posterior end and interrupted between the inner cone and the spine. The latter is laterally compressed, has no keels and is slightly curved upwards (in one of the male shells from Madras (*c*) the spine is very slightly keeled ventrally).

The shell of the female differs in several respects from that of the male. It seems to be still more acuminate at the anterior end, whereas the posterior part is wider. The dorsal surface is more rounded and does not show the three series of stronger tubercles but only three ribs. The ventral surface has a wide groove and the striae are much more convex anteriorly. The inner cone is fused to the outer

¹ Since this memoir was set up in type, Adam (1965, p. 172) has re-examined the type specimens of *S. brevimana* Steenstrup, 1875, and found that the species was conspecific with his *S. winckworthi*. Here the older name *S. brevimana* is re-introduced for this species.

cone over a longer distance and only the extreme posterior part forms a ventral ledge, the flat thickened rim of which is less V-shaped and only weakly concave. The outer cone is broader.

REMARKS: Adam (1939a, p. 7; 1939c, p. 80; 1944, p. 230, 231) discussed the status of this species and of *Sepia rostrata* Férussac & d'Orbigny in detail, as well as the close resemblance of the latter to *Sepia cottesloensis* (Cotton). Unfortunately neither Cotton (1940, p. 438), nor Iredale (1954, p. 79) have taken notice of this fact; the latter author only states that *Sepia rostrata* does not occur in Australia.

3. *Sepia zanzibarica* Pfeffer, 1884
(Pl. 2, figs. 9-11; pl. 41, fig. 247)

Sepia zanzibarica Pfeffer, 1884, p. 9, fig. 11, 11a; Smith, 1916, p. 21; Massy, 1925, p. 211; Tomlin, 1923, p. 40.

TYPE LOCALITY: Zanzibar.

GEOGRAPHICAL DISTRIBUTION: East Africa (Massy, 1925); Natal (Smith 1916; Tomlin, 1923).

MATERIAL:

- a. Madagascar (Coll. Bartlett); B.M. 1874.2.26.1; 1 shell.
- b. Mombasa, 3.x.1950 (Coll. Selfe); B.M. 196352W.; 1 shell (certainly recovered from the animal) and 2 broken shells.

MEASUREMENTS:

SHELLS (IN % OF SHELL-LENGTH)

Loc.	L. in mm	W.	Th.	Str.z.	Spine	Observations
b	184	31	10.6	71	2.7	pl. 2, figs. 9-11
a	163	34	9.2+	67	2.5	

DESCRIPTION: The complete shell from Mombasa is in excellent condition (pl. 2, figs. 9-11). The dorsal surface shows a distinct, but low, median rib and a slight indication of two lateral ribs. The chitinous margins are rather wide in the anterior half. The surface is strongly calcareous with reticulate granules in the posterior portion; these diminish gradually towards the anterior end. The spine is strong, slightly curved upwards, without keels but has long thick, smooth lateral expansions at its base. The ventral surface has a wide median groove over the whole length of the striated area; on both sides of this groove the surface is distinctly convex and the striae are reversed V-shaped. On both sides of the striated area there is a rather wide, nearly smooth, marginal zone, in the middle of which the limbs of the inner cone are situated. These limbs are rather narrow, fused to the outer cone in their anterior part, their outer border rising gradually as a rounded ridge which forms a long convex ledge as in *Sepia aculeata* in its posterior part.

The outer cone is well developed and continuous behind the inner cone as a very narrow chitinous margin, separating the inner cone from the base of the spine.

REMARKS: The shell of *Sepia zanzibarica* resembles that of *S. aculeata* in its inner cone, that of *S. pharaonis* in the wide ventral groove and in the lateral expansions at the base of the spine.

It is certainly closely related to *Sepia thurstoni*, whose ventral surface is flatter and in which the limbs of the inner cone are much broader, whereas there are no lateral expansions at the base of the spine. The tentacular club of *Sepia thurstoni* is slightly different (see p. 4).

Compared with *Sepia lycidas*, the shell of *S. zanzibarica* is thicker with a shallower median groove; it lacks the glaze-like covering of the posterior part of the dorsal surface that is so noticeable in

S. lycidas. The latter has no lateral expansions at the base of the spine. The limbs of the inner cone are narrower and thicker and the posterior ledge is shorter in *S. lycidas*.

Massy (1925, p. 211) has described the hectocotylus, which is "situated on the distal third of the fourth left arm, where about six rows of suckers are arranged so as to leave a bare flattened surface with ridges bordered by a single row of suckers ventrally, while those of the dorsal side are crowded together". We presume that the hectocotylus is situated on the proximal third of the arm.

The female type specimen which has been examined by Adam presented the following relative measurements:—

M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I	A.L. II	A.L. III
168	89	42	21	32	92	9	30	30	33
M.L.d. in mm	M.L.v.	A.L. IV	T.L.	T.cl.	S.a.	S.t.			
168	89	40	92	21	1.2	1.5			

The buccal membrane has a single sucker on five of its tips.

The tentacular club has a narrow swimming-membrane, extending slightly beyond the base of the club. The tentacular stem is triangular in cross-section, keeled on the outer side, the keel not being continuous with the swimming-membrane of the club. The inner surface of the stem is flat or slightly concave with rounded keels at the margins. The club is short, oval, with narrow protective membranes which remain separated at the base of the club and continue down the stem as membranous ridges. The suckers seem to be arranged in six longitudinal series, but probably form oblique transverse rows of eight (pl. 41, fig. 247); the second and third sucker of these rows being widest, the fourth and fifth being nearly as wide while the others are somewhat smaller; their chitinous rings are armed with numerous close-set teeth.

4. *Sepia lycidas* Gray, 1849 (Pl. 3, figs. 12-15; pl. 41, fig. 236)

Sepia lycidas Gray, 1849, p. 103; Hoyle, 1886, p. 24.

Sepiella lycidas, Rochebrune, 1884, p. 89; Adam, 1944, p. 225.

? *Sepia subaculeata* Sasaki, 1914, p. 609, pl. XII, figs. 6, 7; 1929, p. 173; pl. XVI, figs. 13, 14; pl. XVII, fig. 1; text fig. 104.

TYPE LOCALITY: Canton (market).

MATERIAL:

- Canton market (Pres. Tradescant Lay); Gray No. 41a¹; holotype, ♂ (?); B.M. 1963.119W.
- China (from the Chinese Court, International Fisheries Exhibition); B.M. 1884.2.21.17; 1 ♀.
- Inland Sea, Japan (Coll. Gordon Smith); B.M. 1904.10.28.5; 1 ♀.
- Sarawak, Borneo; B.M. 1894.7.14.5; 1 shell.

¹ This number refers to Gray's manuscript Catalogue (1849).

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
<i>b</i>	♀	200	88	50	29	27	—	—	34
<i>c</i>	♀	175	91	44	18	32	95	12	30

Loc.	Sex	M.L.d.	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>b</i>	♀	200	34	40	48	160	25	1.5	0.85
<i>c</i>	♀	175	30	34	36	86	21	1.14	0.80

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
<i>b</i>	♀	198	37	9.6	76	1.5 ⁺	pl. 3, figs. 12 & 13
<i>c</i>	♀	174	35	8.6	80	2.9	
<i>d</i>	—	193	35	8.3	83	2.1	pl. 3, figs. 14 & 15

DESCRIPTION: The type specimen is in very poor condition; it is a salted market specimen, opened and devoid of its inner organs. Its tentacular club resembles that of the specimen from China (*b*) and the dentition of the suckers is exactly the same. The left ventral arm seems to be hectocotylized and of the same type as in *Sepia esculenta*. The shell is in very poor condition but belongs without any doubt to the same species as the other specimens.

The female specimen from China is better preserved. The dorsal mantle-margin is regularly rounded, projecting forward in the middle while the ventral margin is nearly straight. The siphon is very large reaching nearly up to the buccal membrane. The fins are contracted and distorted. The buccal membrane has a small sucker on each of its seven tips. The arm-suckers do not possess any teeth. The tentacular clubs are poorly preserved; each bears about eight rows of subequal suckers, armed with numerous fine denticles all around their chitinous rings.

The dorsal surface of the shell (pl. 3, figs. 12 & 14) is regularly convex with only a slight indication of a median rib. Its posterior portion is covered by a smooth glaze-like substance. The chitinous margins are not very broad. The ventral surface shows a broad median groove. Posteriorly the striae are regularly rounded but anteriorly they become more and more angular and the furrow broader and deeper. The inner cone surrounds a deep posterior pit. Its posterior margin is very thick and rounded, the lateral limbs become flatter and narrower near their anterior end which reaches to about one third of the shell-length. The outer cone is continuous between the inner cone and the base of the spine. The latter is small and damaged.

The female from the Inland Sea is in better condition. The fins begin at a few millimetres behind the mantle margin and extend beyond the posterior end of the mantle.

Some of the tips of the buccal membrane each have a single minute sucker.

The arms are stout; the dorsal and dorso-lateral ones are rounded on their outer sides, the ventro-lateral ones are laterally compressed with slight external keels, and the ventral ones are very stout, compressed, with strong external keels. All the arms are provided with narrow protective membranes.

The tentacular stem is triangular in cross-section, the inner side being flattened and the outer one keeled. The club has a well-developed swimming-membrane on the dorsal side, extending from the tip and reaching nearly to the base of the club (pl. 41, fig. 236). This membrane is situated midway

between the dorsal protective membrane and the outer keel of the stem which continues for a short distance up the club, without being connected with the swimming-membrane.

The two, narrow, protective membranes are not connected at the base of the club and continue as low, membraneous ridges down to the base of the stem. The tentacular suckers are subequal and arranged in eight longitudinal series. Most of the arm-suckers have their chitinous rings armed with numerous, narrow denticles, especially on their distal sides. The rings of the tentacular suckers show the same dentition all around.

The shell is similar to the one described on previous page. Its spine is straight without any keels. The anterior portion of the ventral surface is so flat that in lateral view it is hidden by the lateral margins.

The shell from Sarawak is less well preserved. Its anterior part is less flattened. The spine is curved slightly upwards. The outer cone does not seem to be continuous behind the posterior part of the inner cone, but it is damaged.

REMARKS: *Sepia lycidas* was an insufficiently described species until we had the opportunity to examine the type. *Sepia subaculeata* Sasaki is probably identical with it. The only difference seems to be the relative length of the striated area of the shell, but Sasaki's figure (pl. XVI, fig. 14) represents a smaller specimen and in general the length of the striated zone becomes relatively longer with the growth of the animal.

The main differences between *Sepia lycidas* and *Sepia aculeata* are the ventral groove of the shell in the former species and the hollowed-out portion of the hectocotylus in the latter. The series of tentacular suckers are less numerous in *Sepia lycidas*.

5. *Sepia savignyi* Blainville, 1827

(Pl. 3, figs 16 & 17; Pl. 4, figs. 18 & 19; pl. 41, fig. 238 & pl. 42, fig. 249).

Sepia officinalis Audouin, in Savigny, 1827, p. 11, pl. I, fig. 3 (*non* Linné).

Sepia savignyi Blainville, 1827, p. 285; Férussac & d'Orbigny, 1848, p. 281, pl. IV (*Sepia Savigniana* Férussac); Adam, 1959, p. 142, fig. 6, pl. VIII.

Sepia savigni Rochebrune, 1884, p. 115; Adam, 1944, p. 235.

TYPE LOCALITY (NEOTYPE): Red Sea.

GEOGRAPHICAL DISTRIBUTION: Red Sea.

MATERIAL:

- a. John Murray Exped. St. 27, Gulf of Aden, 11°57'12" N., 50°35'10"E., 12.X.1933, 15-40 fms., bottom, sand and shell; 1 ♀. B.M. 196353W.
- b. Red Sea, Kameron Island, 9.IV.1936 (H.M.S. *Weston*, Coll. Bowen); 27.V.36; 1 ♀. B.M. 196354W.
- c. Persian Gulf (Coll. Townsend); B.M. 1904.2.29.4; 1 shell.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♀	88	93	55	34	39	—	11	33
b	♀	75	88	51	24	41	93	10.5	33
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♀	88	35	39	41	152	28	1.14	1.60
b	♀	75	37	40	36	80	24	1.34	1.60

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
<i>a</i>	♀	88	41	10.2	64	—	pl. 4, figs. 18 & 19
<i>c</i>	—	70	44	10	60	±1.4	pl. 3, figs. 16 & 17

DESCRIPTION: The body is broadly oval and slightly acuminate behind; the mantle-margin projects bluntly in the middle of the dorsal side, it is concave behind the eyes and slightly emarginate ventrally.

All the arms are laterally compressed and have outer keels which are well developed on the ventro-lateral and ventral arms where they form distinct swimming-membranes.

The buccal membrane has a single minute sucker on some of its tips. The subequal arm-suckers are quadriserial.

The tentacles are long and slender with narrow clubs (pl. 41, fig. 238; Pl. 42, fig. 249).

The swimming-membrane is not very wide, hardly extending beyond the base of the club. The protective membranes are narrow, separated at the base of the club and continue down the flattened inner surface of the stem. The tentacular suckers are subequal (the middle ones are slightly larger), arranged in oblique, transverse series of eight, which gives the impression of only six longitudinal series. The arm-suckers have their rings each armed with about 15 rather long, irregular, more or less sharp teeth at their distal margin. The tentacular suckers are provided with the same type of teeth all round.

The shell from the Persian Gulf (*c*) is broadly oval, slightly acuminate at the anterior end, with a very short spine at the posterior end (pl. 3, figs. 16 & 17). The dorsal surface shows a very faint indication of a median and two, lateral, barely-raised ribs. Nearly the whole dorsal surface is granulous, reticulate in the posterior part and showing growth lines in the anterior half. The ventral surface is very flat, with a wide shallow groove in the middle of the striated zone; on the last loculus this groove is much narrower.

The striated zone is concave and flat in its posterior half and slightly convex on both sides of the median groove in its anterior part. The striae are regularly convex in the posterior area and bluntly angular in the anterior one. The striated zone is separated from the outer cone by two broad, nearly smooth, marginal areas. The limbs of the inner cone are situated nearly at the outer margin of these smooth areas; they are rather wide and nearly completely fused to the outer cone. Over a great part of their length, their outer margin is slightly raised as a flat cream-coloured ridge, which forms a somewhat broader flat ledge at the posterior end, surrounding a well-developed excavation.

The outer cone is broad in its lateral parts, continuous at its posterior end, forming a very narrow margin behind the inner cone.

The shell of the specimen from the Gulf of Aden (*a*) has the smooth marginal areas of the ventral side narrower and the limbs of the inner cone situated at the margins of the striated zone (pl. 4, fig. 19). The median groove is less developed, the lateral margins of the inner cone are stouter, and the posterior ledge more rounded. The spine is very small.

REMARKS: The animal of the specimen from the Red Sea (*b*) could be easily confused with *Sepia dollfusi*, especially as regards the tentacular club of the latter (pl. 41, fig. 237). It shows the same narrow ridges on the head.

Its shell is greatly damaged but the presence of a short spine, the remaining parts of the inner cone and the striated area leave little doubt that it belongs to *Sepia savignyi*.

Adam (1959, p. 144) has discussed in detail the status of this species, which has been confused with *Sepia pharaonis* by Férussac & d'Orbigny (1848, p. 281), and with *S. pharaonis*, *S. gibba* and *S. lefebvrei* by Tryon (1879, p. 194, 279, 281 and 287).

6. *Sepia aculeata* Férussac & d'Orbigny, 1835-1848
(Pl. 4, figs. 20 & 21; pl. 42, fig. 251)

- Sepia aculeata* Férussac & d'Orbigny, 1835-1848, p. 287, pls. 5 *bis*, 25; Adam, 1939c, p. 67, pl. II, figs. 1-5; 1944, p. 237; Satyamurti, 1956, p. 179, pl. XXVI, fig. 4.
Acanthosepion aculeatum, Rochebrune, 1884, p. 101; Adam, 1944, p. 230.
Acanthosepion hasselti Rochebrune, 1884, p. 101; Adam, 1944, p. 230.
Sepia blainvillei Férussac & d'Orbigny, 1848, pl. 21 (*non* Deshayes, 1835).
Sepia indica Férussac & d'Orbigny, 1848, p. 288, pl. 21; Adam, 1939c, p. 76.
Acanthosepion indicum, Rochebrune, 1884, p. 112; Adam, 1944, p. 234.
Acanthosepion javanicum Rochebrune, 1884, p. 110; Adam, 1944, p. 233.
Sepia microcotyledon Ortmann, 1891, p. 673, pl. XLVI, fig. 1; Adam, 1939c, p. 77.
 ? *Sepia esculenta* var. ? Robson, 1932, p. 29.

Type species of *Acanthosepion* Rochebrune, 1884.

TYPE LOCALITY: Java.

GEOGRAPHICAL DISTRIBUTION: Indo-Pacific (see Adam, 1939c, p. 67, 70).

Sasaki (1929, p. 173) mentions that this species occurs as far north as Formosa, but doubts Wülker's (1910, p. 11) and Berry's (1912, p. 418) references for Japan as "the species may be easily confounded with *S. subaculeata* Sasaki".

MATERIAL:

ANIMALS

- a. Bombay (from the Bombay Government exhibit, International Fisheries Exhibition, 1883); B.M. 1883.10.27.27; 1 ♀.
- b. Singapore, fish market (Pres. Director, Raffles Museum); B.M. 1947.5.16.6; 1 ♂ (det. Robson, 1923).
- c. Batavia (Brandts Coll. Purchased from Krantz, Berlin); B.M. 1855.12.19.5; 1 ♂.
- d. Penang (East India Museum, Coll. Cantor); B.M. 1860.6.2.86; 1 ♂.

SHELLS

- e. Cochin; B.M. 1879.12.26.131; 1 sp.
- f. Sarawak, Borneo; B.M. 1894.7.14.4; 1 sp.
- g. Singapore (Coll. Archer); B.M. 1908.12.22.19; 1 sp.
- h. Hambantota (Winckworth, 16. xii. 1926); B.M. 1952.12.30.32-33; 2 sp.
- i. Madras (Winckworth, 23. x. 1927); B.M. 1952.12.30.35-38; 4 sp.
- j. Ennūr (Winckworth, 13. ii. 1925); B.M. 1952.11.24.50; 1 sp. (♀)
- k. Jahu Beach, Bombay (Winckworth, 4. xi. 1928); B.M. 1952.11.24.51-53; 3 sp.
- l. Dighe (Winckworth, March, 1929); B.M. 1952.11.24.54-55; 2 sp.
- m. Dighe (Winckworth, 15. iii. 1929); B.M. 1952.12.30.56-57; 2 sp.
- n. Mannar (Winckworth, 30. xii. 1924); B.M. 1952.11.24.60; 1 sp.
- o. Jahu (Winckworth, 4. xi. 1928); B.M. 1952.11.24.61; 1 sp.
- p. Karwar (Winckworth, Feb., 1944); B.M. 1952.12.30.67-68; 2 sp.
- q. Madras (Winckworth, 17. xii. 1928); B.M. 1952.11.24.92; 1 sp.
- r. Madras (Winckworth, 6. vi. 1924); B.M. 1952.11.24.96; 1 sp.
- s. Mannar (Winckworth, 30. xii. 1924); B.M. 1952.11.24.97-98; 2 sp.
- t. Madras (Winckworth, 12. i. 1936); B.M. 1952.11.24.166; 1 sp. (♂)

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
<i>d</i>	♂	113	89	43	24	35	94	9.5	44
<i>b</i>	♂	43	91	53	23	46	93	16	42

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>d</i>	♂	113	49	51	51	102	26	1.6	0.58
<i>b</i>	♂	43	40	42	46	—	—	1.4	—

SHELLS (IN % OF SHELL-LENGTH)

Loc.	L. in mm	W.	Th.	Str.z.	Spine
<i>a</i>	170	36	10	72	—
<i>f</i>	162	35	9	77	3.1
<i>k</i> ¹	162	33	9	71	3.4
<i>j</i>	161	37	8	74	3.7
<i>k</i> ²	160	33	8	72	3.4
<i>k</i> ³	157	35	9	67	3.5
<i>h</i>	143	34	12	63	3.5
<i>p</i> ¹	140	33	7	78	2.9
<i>e</i>	137	34	9	73	2.9
<i>t</i>	136	29	8	79	—
<i>m</i> ¹	124	34	9	69	4.0
<i>l</i> ¹	115	36	8	64	3.9
<i>d</i>	112	34	9	73	3.4
<i>l</i> ²	107	32	8	75	3.7
<i>q</i>	106	33	9	73	4.2
<i>g</i>	104	31	—	57	—
<i>n</i>	97	32	9	61	4.6
<i>p</i> ²	94	35	9	61	4.8
<i>m</i> ²	94	33	8	74	4.8
<i>i</i> ¹	90	34	11	61	4.5
<i>i</i> ²	78	36	10	61	4.5
<i>i</i> ³	67	39	10	51	6.0
<i>s</i> ¹	55	38	10	51	6.4
<i>o</i>	48	40	9	—	8.3
<i>s</i> ²	46	38	9	52	6.5
<i>b</i>	43	40	10	53	4.9
<i>i</i> ⁴	34	43	9	59	7.3

DESCRIPTION: This material agrees with the specimens described by Adam (1939c, p. 67). The male from Penang (*d*) is well preserved. Its dorsal arms are rounded on the outer sides, the lateral ones have slight keels and the ventral ones have strong swimming-membranes. The tentacular stem is triangular in cross-section being keeled on the outer side and flattened at the inner one, with two lateral ridges, these being the continuation of the protective membranes of the club. The swimming-membrane of the latter (pl. 42, fig. 251) is shorter than the sucker-bearing surface and is not connected with the outer keel of the stem. The small subequal suckers are arranged in 12 longitudinal series. Some of the tips of the buccal membrane possess a few minute suckers each. The hectocotylus has about 12 normal suckers at the base, followed by six rows of very small suckers.

In the middle of the dorsal half of the hectocotylized portion is a nearly circular, hollowed-out space, about 2.5 mm in diameter. This feature is not visible in the smaller male (*b*).

The dorsal surface of the shell (pl. 4, figs. 20 & 21) has three distinct low ribs and very narrow chitinous margins. It is rugose and the posterior end is glaze-like.

On the ventral surface the striate zone is slightly convex, except at the posterior end, where it is concave. The last loculus is very short, and slightly concave in the middle.

The striated zone is separated from the outer cone by two wide, smooth, lateral areas; the limbs of the inner cone being situated on these smooth areas. The inner cone is partly applied to the outer cone, but its posterior portion forms a thick, rounded ledge which surrounds the posterior excavation. The outer cone forms only a narrow, chitinous ledge between the inner cone and the spine. The latter is slightly turned upwards and has no keels.

The other animals are in poor condition. The male from Batavia (*c*) shows the characteristic hollowed-out portion of the hectocotylus.

Some of the shells show a very slight median groove on the striated area, but it may be completely lacking.

If we combine this description with the detailed description given by Adam (1939*c*, p. 67) we can summarize the typical characters of this species as follows:—

Tentacular club: subequal, minute suckers arranged in 10 to 12 longitudinal series in the male, in 13 to 14 series in the female.

Hectocotylus: three groups of normal suckers at the base; transformed portion with four to six transverse rows of four very small suckers, the dorsal ones being situated in a deep rounded groove.

Buccal membrane: tips provided with few minute suckers.

Arm suckers: quadriserial, more globular in the male than in the female.

Cuttlebone: Dorsal surface rugose with three ribs, posterior portion covered by glaze-like substance; ventral surface with convex striated area, inner cone with strong, rounded, ventral ledge; spine without keels.

REMARKS: Earlier Adam (1939*c*, p. 78) considered *Sepia smithi* Hoyle, 1885, as a synonym of *Sepia aculeata*. His opinion was based principally on the original figures and description, but he overlooked the fact that Hoyle (1886, p. 125) described the striated area of the shell as being "excavated" which is certainly not the case in *Sepia aculeata*. On the other hand the tentacular club of *Sepia smithi* has a much greater number of longitudinal series of even smaller tentacular suckers.

In his description, Hoyle did not state the number of series of these suckers and his figure (pl. XVI, fig. 3) gives an erroneous impression of it. On p. 19 we give a re-description of *Sepia smithi*.

7. *Sepia elliptica* Hoyle, 1885 (Pl. 5, figs. 24–27; pl. 43, fig. 258)

Sepia elliptica Hoyle, 1885, p. 189; 1885*a*, p. 293; 1886, p. 131, pl. XIX, figs. 14–24; Brazier, 1892, p. 13; Massy, 1916, p. 226; Adam, 1939*c*, p. 72.

Acanthosepion (Fiscisepia) ellipticum adjacens Iredale, 1926*a*, p. 239, pl. XXXV, figs. 5 & 6; 1954, p. 77;¹ Iredale & McMichael, 1962, p. 99.

Acanthosepion ellipticum, Iredale, 1954, p. 77.¹

TYPE LOCALITIES:

a. Challenger Sta. 188, 9°59'S., 139°42'E., Arafura Sea, S. of Papua, 10.ix.1874, 28 fms.; gn. m.

¹ It is not clear from Iredale's text (1954, p. 77) whether he considers the specimens from these Australian localities as belonging to the typical form or to the sub-species (see next page).

b. Challenger Sta. 190, 8°56'S., 136°5'E., Arafura Sea, S. of Papua, 12.ix.1874, 49 fms.; gn. m. GEOGRAPHICAL DISTRIBUTION: Arafura Sea, S. of Papua; Ganjam Coast; Arabian Sea; Queensland; Pellew Group, Gulf of Carpentaria; Melville Island, Northern Territory; N.W. Australia.¹

Sub-species *adjacens*: Capricorn Group, S. end of Great Barrier Reef; Clarence River beach, N.S. Wales.

MATERIAL:

a. Challenger Sta. 188; B.M. 1889.4.24.71-72: 2 syntypes, ♂ and ♀

b. Challenger Sta. 190; B.M. 1889.4.24.73-74: 2 syntypes, ♂ and ♀

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
<i>b</i>	♂	72	88	53	22	44	97	14	37
	♀	54	89	59	27	50	96	15	31

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>b</i>	♂	72	40	42	44	118	14	1.7	0.28
	♀	54	35	35	39	120	15	1.3	0.37

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
<i>a</i>	♂	44	48	9.8	63	—	
<i>b</i>	♂	72	42	10.2	61	—	pl. 5, figs. 24 & 25
	♀	54	47	10.6	58	—	pl. 5, figs. 26 & 27

DESCRIPTION: The original description was based on eight specimens, two males and six females; Massy (1916, p. 227) mentioned these as being in the British Museum, but we found only four of them.²

The tentacular club (pl. 43, fig. 258) is covered with minute suckers, which are arranged in about 10 to 12 series in the middle, and not in eight series as described by Hoyle (1886, p. 132). The protective membranes are connected at the base of the club by a membranous ridge so that the club is distinctly separated from the tentacular stem.

The hectocotylus is only slightly modified. At the base of the left ventral arm seven or eight transverse series of suckers are normal; on the middle portion seven transverse rows have the two ventral suckers slightly smaller while the dorsal ones are considerably smaller than the normal ones; the distal part of the arm is normal. The transformed portion of the hectocotylus measures about 6 mm in length. The larger male is mature, with spermatophores protruding from the penis.

The shells are represented on pl. 5, figs. 24-27; these show all the important details. In both figured specimens the spine is broken; the remaining basal part is rounded, without any keels.

¹ See footnote on previous page.

² It was customary for the author to retain a part of the collection either for his own reference or for deposit in another institution; this applies particularly to *Challenger Cephalopoda*.

REMARKS: In 1939, Adam (p. 72) expressed his opinion that *Sepia elliptica* might be the young stage of *Sepia esculenta*.

The described animals, on previous page, are sexually mature, but in the *Sepiidae* the animals often continue their growth, even to a considerable size, after having attained their sexual maturity for the first time.

In both figured shells of *Sepia elliptica* there is a large unstriated area between the striated zone and the base of the outer cone, the limbs of the inner cone being situated approximately in the middle of these smooth areas. In *Sepia esculenta* the latter are much narrower, but we have seen only much bigger specimens of this species and it is possible that this character changes gradually with the growth of the shell. The striated zone of *Sepia esculenta* is relatively longer and the outline of the striae becomes more and more acutely angular, which is probably also a character linked with age.

We do not see any reason for separating these species specifically, but the study of a great number of specimens may reveal sub-specific differences in relation to geographic distribution.

The shell of *Sepia elliptica* also appears to have some affinity with *Sepia brevimana* Steenstrup, especially as regards the inner and outer cone. The ventral surface of the shell of the latter species is flatter, the sculpture of the dorsal surface is different (see Adam, 1939c, pl. III, figs. 7-9) and the anterior margin is more acuminate. In *Sepia brevimana* the tentacular club has only five series of small subequal suckers. As in the shell of *Sepia officinalis* the posterior portion of the dorsal surface is covered in *Sepia elliptica* by a shiny glaze-like substance, which does not exist in *Sepia brevimana*.

According to Sasaki (1929, p. 179) the specimens reported by several authors from Japan probably all belong to *Sepia robsoni* Sasaki, 1929 (*non* Massy, 1927), which Adam (1939c, p. 77) renamed *Sepia madokai*. But if *Sepia elliptica* is really identical with *Sepia esculenta*, which seems to be a common Japanese species, it is difficult to understand why Sasaki never saw *Sepia elliptica* among the thousands of specimens of *Sepia* which he examined. As we do not have enough Japanese material at our disposal, we cannot take a final decision on this matter.

As to the subspecies *adjacens*, described by Iredale (1926a, p. 239), the author states that its shell is larger than in *Sepia elliptica*, the ventral wall of the inner cone more pronounced, the unstriated area of less extent and the dorsal sculpture less marked. In a later paper, Iredale (1954, p. 77) states the measurements of the subspecies as being 105 × 46 mm. As Adam (1939c, p. 72) pointed out, Iredale's subspecies *adjacens* resembles even more closely *Sepia esculenta*.

Because of the cup-like formation of the inner cone, the outer edge of which is, as it were, hinged in front, Iredale (1926a, p. 239; 1954, p. 77) created a new sub-genus *Fiscisepia* for *Sepia elliptica*. But as *Sepia esculenta* shows exactly the same formation of the inner cone, *Fiscisepia* Iredale, 1926, becomes a synonym of *Platysepia* Naef, 1923.

8. *Sepia ? whitleyana* (Iredale, 1926) (Pl. 6, figs. 28 & 29)

Acanthosepion whitleyanum Iredale, 1926, p. 195, pl. XXIII, figs. 9 & 10; 1954, p. 76; Iredale & McMichael, 1962, p. 99.

TYPE LOCALITY: Port Macquarie, New South Wales.

GEOGRAPHICAL DISTRIBUTION: New South Wales; Queensland; Great Barrier Reef.

MATERIAL:

a. Caloundra, Queensland (Pres. Cotton); B.M. 1962255W; 1 shell.

MEASUREMENTS:

SHELL (IN % OF SHELL-LENGTH)

L. in mm	W.	Th.	Str.z.	Spine	Observations
89	42	9.2	74	5.1	pl. 6, figs. 28 & 29

DESCRIPTION: The shell is broadly oval and rounded at both ends. The dorsal surface is regularly rounded and provided with a broad, low, median rib and two less distinct lateral ribs. The surface is granulous, the granules being arranged along the growth lines. The extreme posterior part is smooth and shiny but not covered by a glaze. The chitinous margins are narrow. The spine is rounded, without any keels and distinctly curved upwards.

The ventral surface is somewhat worn: it seems to be rather flat with a broad but shallow ventral depression. The striae are little convex in the posterior part of the striated area, becoming more and more reversed V-shaped in the anterior part. On both sides of the striated area there is a narrow smooth zone.

The lateral limbs of the inner cone are rather broad and completely fused with the outer cone. The posterior part is raised as a flat, rather thin ledge with a nearly straight transverse margin, the rim of which is thickened. From the latter a few ribs radiate towards the outer cone, the one situated in the median line being the most developed.

The outer cone is rather broad in the posterior half of the shell; it is continuous between the inner cone and the spine. The posterior part of the inner cone surrounds a deep excavation.

REMARKS: This shell has been identified by Cotton and we hope that this identification is correct. It is very useful to see the structure of the inner cone which was only vaguely indicated in the original figure.

In many respects this shell resembles that of *S. thurstoni*, but its mid-dorsal rib is much broader. In *S. whitleyana*, the smooth zones of the ventral surface are narrower, as also are the limbs of the inner cone. In *S. thurstoni* the posterior ledge of the inner cone is much thicker and rounded and the median groove of the striated area is deeper.

In some respects *S. whitleyana* resembles *S. brevimana*, but the shell of the latter is much more acuminate at both ends; its inner cone is very similar but lacks the radiating ribs.

But most of all, this shell resembles that of *S. elliptica*, especially of the male (see pl. 5, figs. 24-27); the only difference being the striated area which seems to be longer in *S. whitleyana* but as this part is worn it is not possible to be sure about this feature. The resemblance is so close, especially as regards the inner cone, that we do not hesitate to identify it with *S. elliptica*. This means that if Cotton's identification is correct we consider *S. whitleyana* a synonym of *S. elliptica*, but without having examined the type of the former species, we do not wish to take a final decision.

The original description of *S. whitleyana* fits the above described specimen fairly well. In his original description Iredale (1926, p. 195) states that the dimensions are 168×65 mm; in his later description (1954, p. 76) he mentions them as being 168×56 mm. Compared with the figure, the former statement seems to be the correct one. The largest specimen, collected opposite Bribie Island, Queensland, measured 235×78 mm (W. = 33%), a series from Michaelmas Cay: 26×10 (W. = 38%), 30×14 (W. = 47%), 34×18 (W. = 47%), 43×20.5 (W. = 48%), 50×21 (W. = 42%), 90×34 (W. = 38%), 102×41 (W. = 40%) and 114×42 (W. = 37%); thus the width of the shell seems to vary a great deal. In his later description, Iredale (1954, p. 76) states that: 'A notable feature of this species is the broad smooth band at each side of the striated area . . .' but 'in the figure the broad band at the side is not emphasized'. In the original description, Iredale does not mention a chitinous covering of the posterior part of the dorsal surface, but in 1954 (p. 76) he states that 'in drying, as noted previously, the horny covering at the base of the spine contracts, and causes the spine to break off, carrying the horny hood with it'. Thus the absence of the chitinous covering in dry shells can not be used as a reliable character. It is noteworthy that in Cotton's specimen, there is no trace of any chitinous covering and the spine is undamaged.

9. *Sepia esculenta* Hoyle, 1885
(Pl. 6, figs. 30-33; pl. 43, fig. 263)

Sepia esculenta Hoyle, 1885, p. 188; 1885a, p. 291; 1886, p. 129, pl. XVII, figs. 1-5; pl. XVIII, figs. 1-6; Sasaki, 1929, p. 175, pl. I, fig. 5; pl. XVI, figs. 15-17; Adam, 1939c, p. 73, pl. IV, figs. 9 & 10; Yasuda, 1951, pp. 350-356; Voss, 1962, p. 3; 1963, p. 28, pl. 2, figs. 2a & b; text-figs. 2a & b.

Platysepia esculenta, Naef, 1923, p. 546.

? *Sepia hoylei* Ortmann, 1888, p. 650; Berry, 1912, p. 419; Adam, 1939c, p. 75.

Diphtherosepion Dabryi (pars) Rochebrune, 1884, p. 81; Adam, 1944, p. 221.

TYPE LOCALITIES: Yokohama market (*S. esculenta*); Japan (several localities) (*S. hoylei*).

GEOGRAPHICAL DISTRIBUTION: Japan.

MATERIAL:

a. Yokohama market, Japan; B.M. 1889.4.24.69-70: 2 syntypes, ♂ and ♀.

b. Inland Sea, Japan (Pres. Gordon Smith); B.M. 1904.10.28.3-4; 1 ♂, 1 ♀.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♂	160	87	47	22	36	94	12.5	36
a	♀	143	87	49	28	36	92	12.5	42
b	♂	130	90	45	35	36	94	13	36
b	♀	148	92	39	19	33	96	13	29

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♂	160	41	39	41	—	—	1.6	—
a	♀	143	41	41 ⁺	44	—	—	1.7	—
b	♂	130	38	40	46	77	18	1.5	0.61
b	♀	148	30	32	35	—	15	1.4	0.61

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
a	♂	158	33	8.9	76	3.2 ⁺	pl. 6, figs. 30 & 31
a	♀	142	39	9.1	81	2.1 ⁺	pl. 6, figs. 32 & 33
b	♀	147	35	8.2	83	—	

DESCRIPTION: The type specimens agree with the original description. Unfortunately their tentacles are lacking. In the specimens from the Inland Sea the tentacular club possesses twelve longitudinal series of minute subequal suckers (Pl. 43, fig. 263). The swimming-membrane extends a little beyond the base of the club. The protective membranes are rather narrow, separated at the base of the club, and continue down the stem as faint membraneous ridges.

The dorsal surface of the mantle shows a series of six or seven, elongate, membraneous papillae along the base of each of the fins.

In the male type the hectocotylus has at its base five transverse series of four normal suckers, followed by five or six series of smaller ones. The male from the Inland Sea has eight series of normal basal suckers and five or six series of smaller ones. The hectocotylized portion occupies the distal half of the proximal third part of this arm.

The shell is very flat, its dorsal surface is granulous with three longitudinal ridges and is covered at the posterior end by a glaze-like substance. The ventral surface has a broad, median furrow. The striae are convex at the posterior end of the striated area becoming more and more angular towards the anterior end. There is a more or less smooth area at both sides of the striated zone. The broad limbs of the inner cone are nearly completely fused with the outer cone, except for the posterior portion which forms a thin ventral ledge with a thicker, rounded, anterior rim. The outer cone is interrupted between the inner cone and the posterior spine.

REMARKS: Except for two records, this species has only been reported from Japan. Hedley (1906, p. 463) mentioned a specimen from Queensland, but according to Iredale (1926a, p. 239) it belongs to a quite different species which this author described as *Ponderisepia eclogaria* and which he reported from Fiji, New Hebrides, New Caledonia and North Queensland. As for the specimen from Singapore market which Robson (1932, p. 29) mentioned with some doubt as a variety of *Sepia esculenta*, it belongs probably to *Sepia aculeata* (see Adam, 1939c, p. 74).

According to Sasaki (1929, 176), *Sepia hoylei* Ortmann is probably identical with *Sepia esculenta*.

On p. 16 we discussed the resemblance between *Sepia elliptica* and *Sepia esculenta*. In the former species the protective membranes of the tentacular club are connected at its base by a membranous ridge so that the club is distinctly separated from the tentacular stem. This character seems to be lacking in *Sepia esculenta*.

More material is necessary to establish the relationship between these species.

10. *Sepia smithi* Hoyle, 1885
(Pl. 7, figs. 34 & 35; pl. 41, fig. 239)

Sepia smithi Hoyle, 1885, p. 190; 1886, pp. 21, 124; pl. 16, figs. 1-12; Brazier, 1892, p. 11; Adam, 1939c, p. 78; Iredale, 1954, p. 77.

TYPE LOCALITY: Challenger Sta. 188, 9°59'S., 139°42'E., Arafura Sea, S. of Papua, 10.ix.1874, 28 fms.; gn. m.

MATERIAL:

a. Syntypes, 2 ♀ ♀; B.M. 1889.4.24.66-67.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♀	85	92	46	29	39	94	12	35
	♀	57	90	49	26	46	91	14	32

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♀	85	33	35	47	94	22	1.2	0.3
	♀	57	35	39	42	97	24	1.2	0.3

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
a	♀	81	37	7.4	72	—	pl. 7, figs. 34 & 35
	♀	55	40	7.3	69	3.6+	

DESCRIPTION: Both animals agree fairly well with the original description. At the base of the fins, the dorsal mantle surface shows five or six, elongate, membraneous papillae; the rest of the surface is covered with small, widely-spaced, round papillae.

The tentacular stem is triangular in cross-section, with a blunt outer keel, the inner side is flattened and bears two, narrow, membraneous ridges, these being the continuation of the protective membranes of the club. The swimming-membrane of the latter extends to its base; it is situated on the dorsal side and is not continuous with the outer keel of the stem. The club is covered with numerous long-stalked suckers, arranged in about 20 longitudinal series (Pl. 41, fig. 239). The two protective membranes are not connected at the base of the club.

There are no suckers on the buccal membrane.

The shell has been well described but the original figure is not very detailed and does not show the exact form of the inner cone. The specimen figured by Hoyle has not been found in the collection of the British Museum. Both the above-mentioned specimens differ from the original figure in the striated area, which is much longer with a more angular outline of the striae and a distinctly wider median groove.

The spine of the larger specimen is broken, but according to Hoyle's description (p. 126) it 'curves gently upwards'. The last loculus is 27% of total shell length in the smaller specimen and 24% in the larger one, whereas Hoyle (p. 125) states and figures it as 29.5%.

The inner cone is well-developed with a rather thick posterior ledge, surrounding the posterior pit. The lateral limbs are applied to the outer cone and form rounded ridges which disappear gradually anteriorly.

REMARKS: The above-described shells show a close resemblance to the one we compared with *Sepia pageora* (p. 22).

As we mentioned on p. 14, Adam (1939c, p. 78) was mistaken in considering *Sepia smithi* to be synonymous with *Sepia aculeata*. If the specimen figured by Hoyle (1886, pl. 16, figs. 1-12) belongs to the same species as the above-mentioned syntypes, *Sepia smithi* is a distinct species, perhaps identical with the specimen from Cape Upstart which we compared with *Sepia pageora* (p. 22).

11. *Sepia pageora* (Iredale, 1954)
(Pl. 7, figs. 36-37; pl. 42, fig. 253)

Sepia indica Gray, 1849, p. 108 (*non* d'Orbigny, 1848).

Acanthosepion pageorum Iredale, 1954, p. 76, pl. IV, figs. 7-9.

TYPE LOCALITY: Keppel Bay, Queensland.

GEOGRAPHICAL DISTRIBUTION: Queensland, Melville Island, Northern Territory, Timor Sea, Broome, Port Cloates, Shark Bay.

MATERIAL:

a. Cape Upstart, Australia (Pres. Jukes); Gray No. 30a; 1 ♂. B.M. 1963118W.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♂	100	89	50	30	38	95	13	50

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♂	100	48	60	60	130	33	1.5	0.25

SHELL (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
a	♂	99	34	7.6	82	3.5	pl. 7, figs. 36 & 37

DESCRIPTION: The dorsal mantle-margin projects forward, reaching up to the mid-level of the eyes.

The arm-suckers are quadriserial, each armed with numerous long denticles especially on the distal side of the chitinous ring. There are no suckers on the buccal membrane.

The tentacular stem is more or less triangular in cross-section with an outer keel. The swimming-membrane does not reach the base of the club; it is situated on the dorsal side and is not connected with the keel of the stem. The narrow protective membranes are separated at the base of the club and continue down the stem as faint ridges. The club is covered with numerous, minute, long-stalked suckers, the rings of these being armed with sharp denticles all around their rims (pl. 42, fig. 253).

The hectocotylus has about eight transverse rows of normal suckers at its base; these are followed by about eight transverse rows of very small suckers, the distal half of the arm being normal.

The shell (pl. 7, figs. 36-37) has a granulous dorsal surface with three distinct longitudinal ribs. The outer margin is chitinous and the posterior part covered with a glaze-like substance.

The ventral surface is flat with a broad, median groove on the striated area; the striae are regularly rounded in its posterior portion but are more and more angular in the anterior part. On both sides of the striated area there is a broad smooth zone. The inner cone is mostly reflected and fused with the outer cone; there is only a thin posterior ridge, surrounding a shallow, posterior depression. The posterior part of the outer cone is wide and continuous behind the rim of the inner cone. The spine is devoid of keels and turned upwards in a regular curve.

REMARKS: This specimen, which Gray (1849, p. 108) identified as *Sepia indica*, certainly does not belong to this species. The shell resembles *Sepia esculenta* very closely and without having examined the animal we would have been inclined to consider it as belonging to this species. But the tentacular club with its numerous minute suckers is undoubtedly different.

The only species which seems to possess a similar shell is *Acanthosepion pageorum* Iredale. The latter species seems to be closely related to *S. whitleyana*, but the posterior part of the inner cone is different and in the specimen we examined of this species there was not a trace of the glaze-like covering on the posterior part of the dorsal surface. As regards the latter feature we refer to our remarks on *S. whitleyana*.

In his introduction to the description of *Acanthosepion pageorum*, Iredale (1954, p. 76) states: "When a common species is well known it has been found that the sexual variation is small and inconstant, and bones cannot be separated into male and female. Apparently in the species of *Acanthosepion* and allied genera there are, however, in many cases, narrow and broad shells, and until animals are studied in series no decision can be made. At the present these are not separated, but regarded as belonging to one species, although this conclusion is open to doubt." As he never described a single animal of the numerous species he created, we wonder how he found that the sexual variation is small and inconstant. In some cases as in *S. brevimana* the bones of males and females

can certainly be separated, unless of course one starts by considering the males and the females as belonging to different species, or if the fact that young specimens have relatively broader bones than older ones is not taken into consideration.

The type-specimen of *S. pageora* measured 135×50 mm (W. = 37%); a series from Lindeman Island, Queensland: 58×24 mm (W. = 41.5%), 90×33 mm (W. = 36%), 124×42 mm (W. = 34%), 146×51 mm (W. = 35%). A narrow bone from the Timor Sea measured 120×39 mm (W. = 32.5%), a broad one from Point Cloates 140×50 (W. = 35.5%), and an immature one from Shark Bay 60×25 mm (W. = 41.5%). These differences are in any case insignificant. According to the author a bone from Bucasra Beach, near Mackay, Queensland, which measured 110×43 mm (W. = 39%), may represent a different form as the dorso-posterior chitinous hood is glistening white, whereas all the other specimens from Queensland show a yellow hood.

If the specimen from Cape Upstart really belongs to *S. pageora*, this species is probably identical with *S. smithi* Hoyle (see p. 20).

12. *Sepia pharaonis* Ehrenberg, 1831 (Pl. 8, figs. 38–43; pl. 41, fig. 240)

Sepia pharaonis Ehrenberg, 1831, p. (?); Adam, 1941, p. 5, pl. II, fig. 1; 1959, p. 130, fig. 2, pls. I–III, IV, fig. 3; 1960, p. 3; Voss, 1963, p. 20, pl. I, figs. *b*, *c* & text-fig. 1f, *g*.

Sepia rouxii Férussac & d'Orbigny, 1841, p. 271, pl. 19; Adam, 1939c, p. 56, pl. I, fig. 4; pl. II, figs. 6 & 7; Satyamurti, 1956, p. 179, pl. xxvi, fig. 3.

Acanthosepion rouxi, Rochebrune, 1884, p. 108; Adam, 1944, p. 232.

Sepia torosa Ortmann, 1888, p. 652, pl. XXIII, fig. 2; Sasaki, 1929, p. 163, figs. 100 & 101; pl. XVI, fig. 11; Adam, 1939c, p. 61.

Sepia framea Ortmann, 1891, p. 675, pl. XLVI, fig. 2; Adam, 1939c, p. 62.

Sepia singalensis Goodrich, 1896, p. 3, pl. I, figs. 4–8; Adam, 1939c, p. 62.

Ascarosepion singhalensis var. *foxi* Robson, 1927, p. 325.

Sepia koettlitzii Hoyle & Standen, 1901, p. 1, pl. I; Adam, 1939c, p. 63.

Sepia formosana Berry, 1912, p. 420, fig. 2, pl. IX, fig. 7; Sasaki, 1929, p. 165, figs. 165 & 166, pl. XXX, figs. 9–11; Adam, 1939c, p. 64.

Crumenasepia hulliana Iredale, 1926, p. 239, pl. XXXV, figs. 1 & 2; 1954, p. 77.

Sepia hulliana, Adam, 1939c, p. 65.

Sepia tigris Sasaki, 1929, p. 168, fig. 167, pl. XXVIII, figs. 13–16; Adam, 1939c, p. 65.

Crumenasepia ursulae Cotton, 1929, p. 90, pl. XV, figs. 3 & 4.

Sepia ursulae, Adam, 1939c, p. 66.

Sepia (*Crumenasepia*) *ursulae*, Cotton & Godfrey, 1940, p. 434, fig. 421.

? *Sepia venusta* Pfeffer, 1884, p. 12, figs. 15 & 15a; Hoyle, 1905, p. 982 (*non* Münster, 1837).

? *Sepia venustoides* Hoyle, 1909, p. 266 (= *Sepia venusta* Pfeffer).

Sepia sinope, Voss, 1962, p. 3 (*non* Gray, 1849).

TYPE LOCALITIES: Tor, Sinai; Massaouah (*S. pharaonis*); Bombay; Red Sea (*S. rouxii*); Tokyo Bay (*S. torosa*); Ceylon (*S. framea*); Colombo; off Point de Galle (*S. singalensis*); Zeila, nearly opposite to Aden (*S. koettlitzii*); Takao, Formosa (*S. formosana*); Howick Island, North Queensland (*S. hulliana*); Taihoku market, Formosa (*S. tigris*); Cottesloe, Rottnest Island (*S. ursulae*); Kabret; Port Taufiq (*S. singhalensis* var. *foxi*); Zanzibar (*S. venusta*).

GEOGRAPHICAL DISTRIBUTION: Indo-Pacific, from the Red Sea to Japan and to Australia.

MATERIAL

- Red Sea (McAndrew); B.M. 1869.6.14.1. (det. Hoyle as *Sepia koettlitzii*); 1 ♀ shell (114×42 mm) (Hoyle, 1901, pl. I, fig. 2).
- Madras Coast, Indian Museum; B.M. 1879.12.26.129–130; 2 shells ($L_M = 250^+$ and 260^+ mm).
- Celebes (from Bleeker Coll.); B.M. 1880.1.17. 5; 1 spec. (macerated).

- d. ? Madras (Pres. F. Day); B.M. 1891.8.20.1; 1 ♀ (poor condition).
- e. Sarawak, Borneo; B.M. 1894.7.14.3; 1 shell.
- f. Ramashveran, Gulf of Mannar (Thurston, 1888); 1 ♂, 1 ♀ (poor condition). B.M. 196359W.
- g. Suez, Nov., 1904 (W.E.H. No. 1075); B.M. 1947.5.5.43. (det. Hoyle as *Sepia rouxi*); 1 ♂ and remains of two shells.
- h. Somaliland; B.M. 1903.1.2.1; 1 broken shell (type of *Sepia koettlitzii*).
- i. Aden Beach, 2.iii.1925; B.M. 1921.11.24.26. (det. Winckworth as *Sepia singalensis*); 1 shell.
- j. Kabret, Suez Canal; B.M. 1926.4.8.6; 1 ♀ (Holotype of *Ascarosepion singhalensis* var. *foxi* Robson, 1927).
- k. Port Taufiq, Suez Canal; B.M. 1926.4.8.5; 1 juv. sp. (paratype of *Ascarosepion singhalensis* var. *foxi* Robson, 1927).
- l. Hambantota, Gulf of Mannar, 16.xii.1926; 1 shell. B.M. 1952.11.24.6.
- m. John Murray Exp. Sta. 27, Gulf of Aden, 10°57'12"N., 50°35'00"E.; 12.x.1933, 37-91 m., s. and sh.; 1 ♂. B.M. 196355W.
- n. John Murray Exp. Sta. 37, Gulf of Aden, 12°47'30"N., 45°04'30"E., 17.x.1933, 18-22 m., s.; 1 ♂. B.M. 196356W.
- o. Hong Kong, 8.x.1938; 1 ♂. B.M. 196357W.
- p. Hong Kong, 15.x.1938; 2 ♂, 1 ♀. B.M. 196358W.
- q. Two miles south of Point de Galle (Sta. XXXIX); B.M. 1947.5.5.34 & 35. (det. Hoyle, 1904 as *Sepia singalensis*); 2 ♀.
- r. Yedda, Arabia (Pres. Trott); B.M. 1947.12.9.1; 1 ♀ (rather poor state).
- s. Mukalla, S. Arabia, Dec., 1948 (Coll. Fraser-Brunner); 1 juv. sp. B.M. 196360W.
- t. Aden, Feb., 1949 (Coll. Fraser-Brunner); 1 ♀, 5 juv. sp. B.M. 196361W.
- u. Berbera, Brit. Somaliland, Feb., 1949 (Coll. Fraser-Brunner); 2 ♂. B.M. 196362W.
- v. Muscat, Arabia (Townsend); 1 juv. sp. B.M. 196363W.
- w. Mersa Fijab (Manihine Coll.); 24.xii.1950; 1 ♂. B.M. 196364W.
- x. Trincomali, 25.xi.1928; B.M. 1952.11.21.27. (det. Winckworth as *Sepia singalensis*); 1 shell.
- y. Madras, 6.vi.1924; B.M. 1952.11.24.4-5. (det. Winckworth as *Sepia rouxi* and *singalensis*); 2 shells.
- z. Mannar, 30.xii.1924; B.M. 1952.11.24.7. (det. Winckworth as *Sepia singalensis*); 1 shell (♀).
- aa. Ennûr, 10.ii.1925; B.M. 1952.11.24.8. (det. Winckworth as *Sepia singalensis*); 1 shell (♀).
- bb. Pari, 22.iv.1929; B.M. 1952.11.24.38; 1 shell.
- cc. Madras, June, 1936; B.M. 1952.11.24.86-87. (det. Winckworth as *Sepia rouxii*); 2 shells (♀ ♀).
- dd. Madras, July, 1936; B.M. 1952.11.24.90-91. (det. Winckworth as *Sepia singalensis*); 2 shells (♂ ♂).
- ee. Madras, Aug., 1936; B.M. 1952.11.24.127. (det. Winckworth as *Sepia rouxii*); 1 shell (♀).
- ff. Madras; 12.i.1936; B.M. 1952.11.24.167-168. (det. Winckworth as *Sepia singalensis*); 2 shells (♀ ♀).
- gg. Madras, July, 1936; B.M. 1952.12.30.31. (det. Winckworth as *Sepia singalensis*); 1 shell (♀).
- hh. Cottesloe, Perth, W. Australia (Pres. B. C. Cotton); B.M. 1962260W; 1 shell. (det. Cotton as *Crumenasepia ursulae* Cotton).

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
<i>t</i>	♀	109	91	49	23	38	100	14	40
<i>j</i>	♀	100	86	43	25	41	95	12	37
<i>n</i>	♂	82	92	44	24	37	94	13.5	37
<i>m</i>	♂	80	84	54	19	41	94	6.2	38
<i>q</i>	♀	41	90	52	24	46	100	14.5	34
<i>w</i>	♂	41	85	52	24	44	93	17	37

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>t</i>	♀	109	38	41	49	138	27.5	1.56	2.75
<i>j</i>	♀	100	37	44	47	120	27	1.80	2.50
<i>n</i>	♂	82	37	37	46	104	24.5	1.10	2.45
<i>m</i>	♂	80	33	35	48	162	31	1.25	2.50
<i>q</i>	♀	41	34	34	39	61	22	1.46	2.45
<i>w</i>	♂	41	37	37	46	122	23	1.22	1.95

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Ventral ledge	Observations
<i>y</i>	—	295	30	8.1	73	3.1	7.8	
<i>l</i>	—	253	32	7.9	71	2.0 ⁺	9.1	
<i>y</i>	—	248	32	8.5	71	3.2	9.7	
<i>e</i>	—	222	34	9.9	72	2.0	7.7	
<i>ee</i>	♀	208	36	8.7	77	—	11.0	
<i>ff</i>	♀	202	33	9.4	77	—	11.9	
<i>i</i>	—	190	32	10.0	63	2.6	7.9	
<i>z</i>	♀	184	36	8.1	73	—	12.5	
<i>f</i>	♀	182	35	8.2	73	—	11.5	
<i>hh</i>	♀	168 ⁺	±37	±10	±75	±4.4	±10.6	pl. 8, figs. 42 & 43
<i>gg</i>	♀	168	35	9.2	68	—	12.5	
<i>aa</i>	♀	153	35	9.2	65	2.6	10.5	pl. 8, figs. 40 & 41
<i>x</i>	? ♂	150	33	9.3	64	3.0	10.0	pl. 8, figs. 38 & 39
<i>cc</i>	♀	145	34	8.6	72	2.1	8.9	
<i>cc</i>	♀	143	34	9.1	69	2.1	9.8	
<i>ff</i>	♀	133	35	9.4	71	—	11.2	
<i>u</i>	♂	133	33	7.9	72	—	9.0	
<i>dd</i>	♂	130	34	9.2	65	1.9	10.8	
<i>dd</i>	♂	125	33	9.6	64	1.6	12.0	
<i>t</i>	♀	109	33	9.2	59	3.7	8.3	
<i>j</i>	♀	101	36	10.9	57	—	9.9	
<i>m</i>	♂	80	36	10.0	55	—	8.8	
<i>n</i>	♂	79	32	7.6	67	3.8	8.9	
<i>c</i>	—	73	34	8.6	62	2.7	4.8	
<i>t</i>	—	58	36	8.6	53	3.4	11.2	
<i>bb</i>	—	58	35	7.8	60	4.3	8.6	
<i>t</i>	—	52	38	8.3	56	4.8	7.7	
<i>q</i>	♀	41	41	8.3	61	3.7	7.3	
<i>w</i>	♂	41	35	6.1	61	3.6	2.4	
<i>s</i>	juv.	40	35	8.2	65	—	5.0	
<i>k</i>	juv.	29	43	7.9	62	3.4	3.4	
<i>q</i>	—	16.5	48	—	60	3.0	—	

DESCRIPTION: Most of the animals are in rather poor condition, except those from the John Murray expedition (*m* and *n*).

In these two young males the dorsal arms are laterally compressed and the other ones strongly-keeled on their outer sides. The arm-suckers are irregularly denticulate on their distal margins, with well-developed papillate zones and radially-grooved outer areas which are slightly emarginate distally.

The buccal membrane is provided with a small sucker on some of its tips.

The tentacular stem is triangular in cross-section. The long club has a rather narrow swimming-membrane which extends slightly beyond the base of the club. The protective membranes are narrow and separated at the base of the club where the suckers are small and rather numerous. In the middle part of the club the suckers are arranged in very oblique, transverse series of eight, the third and the fourth sucker being much larger than the other ones (pl. 41, fig. 240).

In the smaller of these two males, the hectocotylus is not yet formed; in the larger one the left ventral arm bears about 12 transverse series of normal suckers proximally, followed by about 10 series in which the ventral suckers are of normal size but the dorsal ones are minute and separated from the ventral ones by a fleshy, transversely-grooved ridge.

At the base of the fins there is a series of elongate papillae, whereas the rest of the dorsal surface is covered by numerous small papillae.

The shell is elongate-oval; its dorsal side has three longitudinal ribs, it is granulous in surface texture and has rather broad chitinous margins.

The ventral surface has a wide shallow groove in the middle of the striated zone, the last loculus being very faintly grooved. On both sides of the striated zone there is a narrow, smooth area along the middle of which extend the narrow, rounded limbs of the inner cone. In its posterior part, the latter forms a long ventral ledge which is convex posteriorly but flat or even slightly concave in its anterior part.

The spine is devoid of keels but possesses two thick, lateral expansions at its base.

REMARKS: Adam (1939c, p. 60) has discussed the relationship between the different species enumerated in the synonymy of *Sepia pharaonis* and we have added *Sepia venustoides* Hoyle (= *S. venusta* Pfeffer *non* Münster) with some doubt. This species was based on a small specimen (mantle-length: 35.5 mm) from Zanzibar. Its tentacular club has eight, longitudinal series of suckers, with about five particularly big suckers in the middle. The shell does not seem to differ from that of a young *Sepia pharaonis*.

According to Iredale (1954, p. 77): "Adam has lumped all the species of *Crumenasepia* under the name *rouxii*, given to a bone from Bombay, India, supposing a range from Somaliland to Japan, although differences have been recorded in the animals from various localities and names proposed by efficient students."

Unfortunately, Iredale (1926a, p. 239) did not mention any differences between his *Crumenasepia hulliana* and other species; he only states (p. 240): "This represents a well marked group of which two or three species have been described as *Sepia singalensis* Goodrich from Ceylon, *S. koettlitzii* Hoyle & Standen from Somaliland and probably *S. zanzibarica* Pfeffer from Zanzibar." It is astonishing that he adds this last species, the shell of which has a completely different inner cone, like that of *Sepia aculeata*. His description does not give any character which permits us to distinguish his species from *Sepia pharaonis*.

Sepia pharaonis, as we understand it, seems in fact to have a very wide distribution, but certain species are widely distributed and we do not see the necessity to separate species only on the basis of their geographical distribution. In this respect it is noteworthy that Iredale never described the animal of even one of his numerous new species; they were all described on the cuttlebones, which

may float for a very long time and over very long distances, so that we are not even sure that these species really live on the coasts of Australia.

As to the differences which, according to Iredale, have been recorded in the animals from various localities, he does not mention any. There exist of course minor differences not only between animals from different localities but even from the same locality, but these may be attributed to individual variation, to age or to sex.

As Adam (1939c, p. 60-66) has discussed in detail the differences between these species and the reasons why we cannot distinguish them specifically, we refer to his paper.

We are indebted to Miss Virginia Orr (Philadelphia) who kindly lent us the specimen from Manila market which Voss (1962, p. 3) called *Sepia sinope*, but which is a young *S. pharaonis*.

13. *Sepia prashadi* Winckworth, 1936
(Pl. 9, figs. 44-48; pl. 41, figs. 245 & 246)

Sepia prashadi Winckworth, 1936, p. 16; Viader, 1937, p. 1; Adam, 1939c, p. 86, tabl. V; 1941, p. 109, pl. II, fig. 3; 1941a, p. 1; 1942, p. 10; 1944, p. 237; 1959, p. 134, figs. 3 & 4, pl. IV, figs. 1 & 2, pl. V.

TYPE LOCALITY: Madras.

GEOGRAPHICAL DISTRIBUTION: Mauritius (Viader, 1937); Madagascar (Adam, 1941); Gulf of Suez (Adam, 1959).

MATERIAL:

a. Madras, 1.iv.1930; B.M. 1952.11.24.59; 1 shell (holotype).

b. John Murray Exp. Sta. 75, Gulf of Oman, 25°10'48"N., 56°47'30"E., 28.xi.1933, 201 m., gn. m.; 7 ♂, 4 ♀. B.M. 196365-68 W.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
b	♂	120	89	48	25	37	83	6.7	42
	♂	117	83	45	26	37	77	9.4	44
	♂	88	81	42	28	42	—	8.0	43
	♂	69	83	—	25	45	—	—	41
	♀	120	86	49	29	36	79	8.3	38
	♀	106	84	49	25	38	80	—	35
	♀	81	84	—	26	37	—	—	39

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
b	♂	120	42	43	42	—	—	1.84	—
	♂	117	41	44	39	—	—	1.71	—
	♂	88	39	39	40	91	18	1.94	5.7
	♂	69	41	41	43	138	22	1.74	6.1
	♀	120	36	38	42	—	—	1.67	—
	♀	106	35	38	38	—	—	1.88	—
	♀	81	39	39	39	105	17.5	1.60	5.6

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
b	♂	120	30	10.6	58	4.6	pl. 9, figs. 46-48
		88	31	10.8	53	5.7	pl. 9, figs. 44 & 45
		81	32	9.8	54	6.2	
		69	33	10.2	57	4.3	
a	♀	84	30	8.3	68	3.0	Holotype

DESCRIPTION: Although the shells of this species have been reported from different localities outside the Red Sea, the animals have only been described from the Gulf of Suez (Adam, 1959, p. 134). The study of the additional specimens from the Gulf of Oman gives us the opportunity to complete this description.

The fins begin several millimetres distance from the mantle-margin and do not seem to be very large, but most of the specimens are rather contracted. At the posterior end the fins are distinctly separated.

The arms are sub-equal, the dorsal ones are slightly keeled at the distal end of their outer sides, the dorso-lateral and ventro-lateral ones are more strongly keeled along their whole ventral margins, and the ventral ones have strong swimming-membranes on their outer sides. All the arms have narrow protective membranes.

The suckers are more or less globular in the male and are quadriserial throughout the whole length of the arm. In the greater proximal part the outer suckers are smaller than the inner ones; but on the distal effiliated tips, the outer ones are slightly wider than the inner ones, except on the ventral arms.

The hectocotylus has two groups of four suckers at its base. The transformed portion of this arm occupies the greater part of the length; it is broadened, especially in the middle, flattened and with transverse folds. The suckers are very small, the two ventral rows being very close together, forming practically a single series. The dorsal suckers of the hectocotylized part are larger than the ventral ones. In the basal half of the transformed portion, the two dorsal series are wide apart, one in the middle, the other at the dorsal margin. In the distal part, these series come closer and closer together. The distal tip of this arm has four series of minute normal suckers. There are 12 to 14 transverse rows of four suckers on the hectocotylized portion.

The tentacular stem is rounded. The club is short and broad, with a strong swimming-membrane on the dorsal side, its length slightly exceeding that of the club. The sucker-bearing part of the club is nearly completely detached from the tentacle by a deep furrow underneath the dorsal protective membrane (pl. 41, figs. 245 & 246). Both protective membranes are well developed; they come close together at the base of the club, but remain separate and do not seem to continue down the stem.

The tentacular suckers appear to be arranged in very oblique transverse series of eight, but owing to the enormous development of the third sucker from the second to the fourth series, especially from the second and third one, all the other, smaller, suckers are pushed aside.

In the female, the suckers of the sessile arms are less globular than in the male. The tentacular club does not show any difference. The ventral part of the buccal membrane is not expanded ventrally.

The shell is elongate with three ribs on its dorsal surface; the latter is strongly rugose, especially in the anterior part and on the lateral margins of the posterior end. The shell is rather thick with a narrow, median furrow over the whole length of its ventral surface; this groove widens at the anterior end of the last loculus. The striated zone is mostly convex, except in its posterior portion, and shows two broad ribs separating the ventral part from the lateral areas.

There are two narrow smooth areas between the striated zone and the outer cone.

The limbs of the inner cone lie approximately in the middle of each smooth area. In the posterior half of the striated zone, the limbs of the inner cone are widened and fused with the outer cone. Only the posterior end of the inner cone is raised in a thick ledge which surrounds the posterior pit. The rather narrow outer cone completely surrounds the inner cone. The spine is strong, straight, directed slightly upwards; it has a strong ventral and a less well-developed dorsal keel.

REMARKS: In all the specimens from the Gulf of Oman, the big suckers on the tentacular club are much more developed than in those from the Gulf of Suez (Adam, 1959, pl. IV, fig. 2). For the moment we do not know if this character has any sub-specific significance. It may be only a variable character because two female specimens (M.L.d. = 79 and 78 mm) and a male specimen (M.L.d. = 91 mm) from the southern Red Sea (belonging to the Department of Zoology of the Hebrew University of Jerusalem), also have enormous tentacular suckers, the indices being 5.7, 6.0 and 5.2%.

14. *Sepia recurvirostra* Steenstrup, 1875
(Pl. 9, figs. 49–52; pl. 10, figs. 53 & 54)

Sepia recurvirostra Steenstrup, 1875, p. 475, 479; Tryon, 1879, p. 197; Hoyle, 1886, pp. 23, 137, 205, 218; Adam, 1939c, p. 88; Voss, 1963, p. 36; Adam, 1965, p. 169, pl. 29, figs. 1–3.

Sepia singaporensis Pfeffer, 1884, p. 10, figs. 13 & 13a; Hoyle, 1886a, p. 231; 1886, p. 128; Goodrich, 1896, p. 3; Massy, 1916, p. 225; Robson, 1932, p. 29; Adam, 1939c, p. 81, pl. III, fig. 3.

? *Sepia pagenstecheri* Pfeffer, 1884, p. 9, figs. 12 & 12a; Adam, 1939c, p. 84.

Sepia esculenta, Joubin, 1897, p. 102 (*non* Hoyle, 1885); ?Massy, 1916, p. 225.

TYPE LOCALITIES: South China (*S. recurvirostra*); Singapore (*S. singaporensis*); Hong Kong (*S. pagenstecheri*).

GEOGRAPHICAL DISTRIBUTION: Singapore; Burma; Borneo Bank; Java Sea.¹

MATERIAL:

- a. ? N. China (Purchased Jamrach); B.M. 1863.5.1.6; 1 ♂ (macerated).
- b. Santubong and Buntal, Sarawak (Coll. E. Bartlett); B.M. 1894.7.14.6; 1 shell.
- c. Singapore fish market (Pres. Director, Raffles Museum); B.M. 1947.5.16.2. (det. Robson); 1 ♂.
- d. Singapore, May, 1933 (Coll. Winckworth); B.M. 1952.11.24.93; 1 shell
(this shell probably belonged to a male specimen presented by Winckworth to the Royal Institute of Natural Sciences in Brussels).

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
c	♂	60	90	50	28	42	93	—	45
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
c	♂	60	45	50	45	—	—	1.7	—

¹ The exact locality is 6° 36', 5 S., 114° 55', 5 E.; as a result of a printing error it was given as 144° 55' 5 E. by Adam, 1939c, p. 82.

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
<i>a</i>	♂	71	32	9.3	62	2.8	pl. 10, figs. 53 & 54
<i>c</i>	♂	60	30	7.8	65	3.3	pl. 9, figs. 49 & 50
<i>b</i>	—	55	35.5	8.6	65	2.7	
<i>d</i>	? ♂	45	32	7.1	62	4.4	pl. 9, figs. 51 & 52

DESCRIPTION: The animal from N. China (*a*) is macerated. The right ventro-lateral tip of the buccal membrane is longer and thicker than the other ones and bears a minute sucker.

The shell of this specimen (pl. 10, figs. 53 & 54) differs from the other ones in that the anterior part of the striated area is broader and a little more convex and also in the slightly narrower limbs of the inner cone. The locality and the identity of this specimen remain somewhat doubtful until more material becomes available.

The animal from Singapore (*c*) has arms with narrow tips and has quadriserial suckers nearly to the tip. The arm-suckers have their chitinous rings each armed with about 15 bluntly-sharp teeth in their distal part. The hectocotylus has four or five rows of normal suckers at the base, followed by about six rows of smaller suckers, the rest of the arm being normal. On the short, modified portion of the hectocotylus the ventral suckers are slightly larger than the dorsal ones. The buccal membrane is devoid of suckers.

The tentacular club has been described by Pfeffer (1884, p. 10) and by Adam (1939*c*, p. 82); its suckers are arranged in five or six longitudinal series, the middle one of them possessing five or six large suckers. The swimming-membrane extends for a short distance beyond the base of the club; the protective membranes are fused at the base. In the male type specimen of *S. singaporensis* the distal ends of its dorsal arms are very narrow and provided with only two series of suckers, while the tips are devoid of suckers.

The shell is elongate oval and regularly acuminate in its anterior half. The dorsal surface has a low, narrow, median rib and is covered with delicate granules, arranged along the growth-lines; the chitinous margins are narrow and the extreme posterior portion is smooth and shiny. The ventral surface is flattened with a very narrow median furrow in the striated area and a broader depression in the last loculus; the striae are regularly convex. The striated area is separated from the outer cone by two, nearly smooth, slightly-concave marginal zones. The lateral limbs of the inner cone are attached to the margins of the striated area; they are rather broad in their posterior part and are fused to the outer cone. Only the extreme posterior portion is raised as a thin ledge and connected with the outer cone by a dark-coloured thick callous substance which is emarginate in front. The spine is short, turned upwards and without any keel.

REMARKS: On p. 39 we discuss the differences between *S. recurvirostra* and *S. papuensis* and on p. 44 those between *S. recurvirostra* and *S. plangon*.

After having examined the type-specimens, Adam (1939*c*, p. 84–85) came to the conclusion that *S. pagenstecheri* Pfeffer, 1884, from Hong Kong, does not seem to differ in any important character from *S. recurvirostra*, but that more material should be studied before taking a definite decision.¹

¹ Since this manuscript was set up in type, Adam (1965, p. 169) has examined the type specimens of *S. recurvirostra* Steenstrup from the Copenhagen Museum; these prove to be conspecific with *S. singaporensis*, the former name having priority.

15. *Sepia officinalis vermiculata* Quoy & Gaimard, 1832
(Pl. 10, figs. 55 & 56; pl. 45, fig. 271)

Sepia vermiculata Quoy & Gaimard, 1832, p. 64, pl. I, figs. 1-5; Férussac & d'Orbigny, 1835-1848, p. 279, pl. 3 *bis*; Smith, 1916, p. 20; Robson, 1924, p. 12; Massy, 1925, p. 209; 1928, p. 91.

Acanthosepion vermiculatum, Rochebrune, 1884, p. 113; Adam, 1944, p. 234.

Acanthosepion vermiculata, Robson, 1924a, p. 639; Massy, 1927, p. 156.

? *Sepia hierredda* Turton, 1932, p. 2 (? *non* Rang).

? *Sepia jousseaumi* Rochebrune, 1884, p. 117; Smith, 1916, p. 22; Adam, 1941, p. 108, pl. IV, fig. 3; 1944, p. 235.

Sepia officinalis vermiculata, Adam, 1941, pp. 99, 102, 106, pl. IV, fig. 1; 1962, p. 11; Voss, 1962b, p. 249.

TYPE LOCALITIES: Cape of Good Hope (*S. vermiculata* and *S. jousseaumi*).

GEOGRAPHICAL DISTRIBUTION: South Africa.¹

MATERIAL:

a. Port Natal (Purchased Ayres); B.M. 1862.12.19.7; 1 ♂.

b. S. Africa (Ponsonby); B.M. 1890.5.20.55; 1 shell.

c. Port Elizabeth (Spencer); B.M. 1890.12.14.35-38; 4 shells (damaged).

d. Natal (Mar. Biol. Surv., Gilchrist, Sta. 386); B.M. 1924.9.9.41-42; 1 ♂ (det. Robson).

e. Delagoa Bay, Oct., 1912 (Coll. Barnard, No. 1317a); B.M. 1926.10.20.41; 1 ♀ (M.L.d. = 128 mm).

f. Delagoa Bay, Oct., 1912 (Coll. Barnard, No. 1317d); B.M. 1926.10.20.42. (animal) and 1926.10.20.44 (shell); 1 ♂ (M.L.d. = 68 mm).

g. Knysna Estuary (Univ. Cape Town, Ecol. Surv., KNY. 8B, 15.vii.1947, J. H. Day); 1 ♀. B.M. 196369W.

h. Knysna Estuary, dredged in main channel between Leisure Isle and Theseus Wharf, 2-6 m (Univ. Cape Town, Ecol. Surv., KNY, 8B., 15.vii.1947, J. H. Day); 1 ♀.

i. Univ. Cape Town, Ecol. Surv., DBN. 15 R., 10.vii.1950, J. H. Day; 3 ♀ (M.L.d. = 105, 70 and 47 mm); B.M. 196370W.

j. Idem, BMR. 13 A, 10.ix.1950, J. H. Day; 2 ♀ (M.L.d. = 96 and 68 mm); B.M. 196371W.

k. Idem, BMR. 27 A, 15.ix.1950, J. H. Day; 2 ♀ (M.L.d. = 61 and 59 mm); B.M. 196372W.

l. Isipingo (Falcon); B.M. 1952.11.24.80; 1 shell.

m. Isipingo (Falcon); B.M. 1952.12.30.74; 1 shell.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L I
d	♂	148	78	49	26	41	100	15	44
g	♀	120	85	54	33	42	98	13.5	33
Loc.	Sex	M.L.d. in mm	A.L. II.	A.L. III.	A.L. IV.	T.L.	T.cl.	S.a.	S.t.
d	♂	148	47	54	57	—	34	1.7	5.4
g	♀	120	33	33	46	150	32	1.7	3.3

¹ According to Barnard (*in litt.*) it occurs as far north as Chinde, mouth of the Zambesi River.

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
<i>d</i>	♂	148	40	13	51	3.4	
<i>g</i>	♀	117	39	12	51	3.0	
<i>j</i>	♀	68	40	12	53	4.4	
<i>k</i>	♀	60	40	12.5	50	3.3	
<i>k</i>	♀	55	44	13.5	53	—	
<i>l</i>	—	115	41	10.5	50	—	pl. 10, figs. 55 & 56
<i>m</i>	—	93	41	11	40	5.4	

DESCRIPTION: Most of the animals are in poor condition. The male specimen from Natal (*d*) has zebra-like stripes on the dorsal mantle surface. The dorsal margin protrudes in a bluntly-rounded right angle, reaching to the mid-level of the eyes. All the arms are keeled on the outer sides. The arm-suckers usually have smooth chitinous rings, but those of the distal ones are finely incised.

The left ventral arm is hectocotylied on a little less than half of its length. At the base there are two groups of three and one row of four normal suckers, followed by about 12 transverse rows of smaller ones, situated on the ridges of the flat transformed portion. The two, ventral, longitudinal series are close together, near the ventral margin, the third series is about in the middle of the arm and much smaller than the other ones, while the dorsal series shows the suckers of about the same size as the ventral ones, it is situated between the third series and the dorsal margin.

The tentacular club has a broad swimming-membrane which is slightly shorter than the club. The narrow, protective membranes remain separated at the base of the club and continue down the stem as low membraneous ridges.

The tentacular suckers are apparently arranged in five or six series but form, in fact, oblique transverse rows of eight (pl. 45, fig. 271). Six or seven suckers of the third longitudinal series are much larger, those of the second series are half as wide, those of the first and fourth series half as wide as those from the second one. The big suckers have smooth chitinous rings, the smaller ones show numerous fine denticles.

The shell is broadly oval (pl. 10, figs. 55 & 56); its dorsal surface is coarsely granulous with a faint median rib, and its posterior portion is covered by a glaze-like substance. The ventral surface is rather convex with a median rib. The striae are regularly convex except in the middle where they are slightly concave on the median rib. The inner cone is rather large; it is completely fused to the outer cone and surrounds a small depression. The outer cone is broad and continuous behind the inner cone. The rounded spine is nearly straight, directed slightly towards the ventral side.

The figured shell from Isipingo (pl. 10, figs. 55 & 56) is flatter than the other ones; its striae are more wavy.

REMARKS: This sub-species is certainly very closely related to *Sepia officinalis hierredda* Rang from the West African coast. The animals do not show any noteworthy difference as regards their relative measurements, their tentacular clubs and their hectocotyli. The specimens hitherto described show an enormous difference in maximum size: *S. officinalis hierredda* attaining a mantle-length of 360 mm in the males and 280 mm in the females (Adam, 1941 and 1952), whereas in *S. officinalis vermiculata* the males measure up to 148 mm, the females up to 147 mm (Adam, 1962). But the fact that no bigger animals are present in the collections does not prove that they do not exist.

The shells of the two races seem to be slightly different, those of *vermiculata* being somewhat wider and thicker, as shown by the following comparative table of the relative measurements.

Sub-species	Sex	Number	L. in mm	W.	Th.	Str.z.	References
<i>hierredda</i>	♂	20	52-360	30-37	9.8-13	42.5-65	Adam, 1941 and 1952
<i>vermiculata</i>	♂	4	91-148	36-40	11.3-13.1	40-55	Adam, 1941, 1962 and present paper.
<i>hierredda</i>	♀	35	40-280	33-41	7.0-12.5	37.5-72	Adam, 1941 and 1952
<i>vermiculata</i>	♀	6	55-147	39-44	9.5-13.5	47-64	Adam, 1941, 1962 and present paper.

Moreover, the posterior part of the shell seems to be more broadly rounded and the dorsal surface more coarsely granulous in *vermiculata*.

Sepia officinalis hierredda (pl. 11, figs. 57-60) is a very common littoral cephalopod of the West African coast where it has been reported, until now, between 21° N. and 16°30' S., in 0-100 m depth. Further collecting between Angola and South Africa may extend the southern limit of its distribution further south and more collecting of *Sepia officinalis vermiculata* in South Africa may prove that the small differences mentioned between the two sub-species are not sufficient to separate them. But for the moment we think it advisable to keep them separate.

At its northern limit, *Sepia officinalis hierredda* meets *Sepia officinalis officinalis* Linné, 1758, in Levrier Bay (Mauritania), where Adam (1941, p. 98) found intermediate forms between the two, which seems to prove that they are both sub-species of *Sepia officinalis*. The nominate sub-species extends from Levrier Bay up to the Atlantic coast of France and probably into the Mediterranean. A fourth sub-species: *Sepia officinalis filliouxii* Lafont, 1868, even reaches the southern coast of Scandinavia. A fifth sub-species, *Sepia officinalis mediterranea* Ninni, 1884, lives in the Mediterranean (Adam, unpublished observations).

As very few authors have described the material they mention of *Sepia officinalis*, it is for the moment impossible to give an exact review of the European sub-species and of their distribution (see Adam, 1941).

It is noteworthy that the young animals of the different sub-species cannot be distinguished.

16. *Sepia vicellius* Gray, 1849

Sepia vicellius Gray, 1849, p. 100; Adam, 1959, p. 151.

? *Sepia vicellus*, Rochebrune, 1884, p. 116; Adam, 1942, p. 3; 1944, p. 235.

TYPE LOCALITY: unknown.

GEOGRAPHICAL DISTRIBUTION: ? Red Sea (Rochebrune).

MATERIAL:

a. Locality unknown, Gray No. 29 a, b; 1 ♂ (holotype). B.M. 1963120W.

DESCRIPTION: The animal is in a rather macerated condition and the shell is badly damaged, its posterior portion being completely destroyed.

The tentacular club, the hectocotylus and the remaining part of the shell do not leave any doubt that this specimen belongs to *Sepia officinalis*.

REMARKS: As Adam (1944, p. 235, 1959, p. 151) pointed out, the specimen from the Red Sea mentioned by Rochebrune (1884, p. 116), is poorly preserved, with its shell lacking.

As Gray's specimen belongs to *Sepia officinalis*, a species which has never been found in the Red Sea, we suppose that Rochebrune's specimen was some other form.

17. *Sepia latimanus* Quoy & Gaimard, 1832
(Pl. 11, figs. 61-63; pl. 45, figs. 269A)

Sepia latimanus Quoy & Gaimard, 1832, p. 68, pl. 2; Férussac & d'Orbigny, 1848, p. 283, pls. 12, 17; Whitelegge, 1889, p. 282; ? Brazier, 1892, p. 11; ? Meyer, 1909, p. 331; Chapman, 1912, p. 25; Wülker, 1913, p. 455; Robson, 1932, p. 31; Adam, 1939c, p. 41, pl. I, figs. 1-3; Voss, 1963, p. 26, pl. I, figs. d-e & text-fig. 2d & 3b.

Sepia rappiana Férussac, 1835, pl. 10; Adam, 1939c, p. 47.

Acanthosepion rappianum, Rochebrune, 1884, p. 105; Adam, 1944, p. 232.

Sepia hercules Pilsbry, 1894, p. 144; 1895, p. 2, pl. I, figs. 1 & 2; Sasaki, 1929, p. 177, figs. 168 & 169; Adam, 1939c, p. 48.

Ponderisepia eclogaria Iredale, 1926a, p. 239, pl. XXXV, figs. 7 & 8; 1954, p. 78.

Sepia eclogaria, Adam, 1939c, p. 49.

Sepia harmeri Robson, 1928, p. 8, figs. 2 & 3; Adam, 1939c, p. 49.

Sepia mozambica Rochebrune, 1884, p. 118; Adam, 1939c, p. 50; 1944, p. 235.

TYPE LOCALITIES: Port Dorey (*S. latimanus*); Kangaroo Island (*S. rappiana*); Loo Choo Islands (*S. hercules*); Masthead Island (*P. eclogaria*); Poulo-Condor (*S. harmeri*); Mozambique (*S. mozambica*).

GEOGRAPHICAL DISTRIBUTION: Indo-Pacific, from Australia to Japan and from Malaya to Fiji Islands.

MATERIAL:

a. Sarawak, Borneo; B.M. 1894.7.14.2; 1 shell.

b. Singapore, fish market (Pres. Director, Raffles Museum, Singapore); 1947. 5.16.1; 1 ♀.

c. Phare's Island, lagoon of Noumea, New Caledonia, May, 1961 (Pres. Bidder); 1 shell.
B.M. 196373W.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
b	♀	265	85	45	40	38	89	15	40
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
b	♀	265	49	43	53	130	27	1.5	3.4

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex.	L. in mm	W.	Th.	Str. z.	Spine	Observations
a	—	330	36	±9.7	±67	4	pl. 11, figs. 61 & 62
b	♀	260	36	10	65	—	

DESCRIPTION: The right ventral arm is bifid at the tip in the animal from Singapore (pl. 11, fig. 63); there is a dorsal branch of 22 mm and a ventral one of 14 mm, both bearing four rows of suckers and the number of suckers is doubled before the bifurcation of the arm.

The web is a little less developed than in *S. apama*, reaching about halfway along the length of the arms, except between the ventral arms where it is absent.

The three tubercles seen behind each eye in *S. apama* are lacking.

The tentacular club strongly resembles that of *S. apama*, in the sucker-bearing surface being completely surrounded by the protective membranes which are fused at the base, and in the deep groove

between the swimming-membrane and the dorsal protective membrane, detaching the sucker-bearing surface nearly completely from the stem (pl. 45, fig. 269A). The swimming-membrane extends only slightly beyond the base of the club; in *S. apama* it is longer.

The shell shows a very faint indication of three dorsal ribs, but this surface is almost regularly convex, much more so than in *S. apama*, and is strongly rugose on the whole surface, except on the narrow chitinous margins. The ventral surface has a distinct median groove, the striae being strongly reversed V-shaped in the anterior portion of the striated area. The inner cone is completely fused to the outer cone, its outer margin forming a distinct, flat, shiny, zone which is slightly raised in its posterior part; a similar formation is seen in the shell of *Sepia savignyi*, which differs from that of *S. latimanus* in the slightly-broader inner cone and the less-rounded, more acuminate anterior end. The outer cone is continuous behind the inner cone as a very narrow chitinous margin. The spine is strong and straight, without any keels and with a ventral notch at its base.

REMARKS: Adam (1939c, pp. 45-51) has already discussed in detail the different species given above as synonyms of *Sepia latimanus*. Concerning *Ponderisepia eclogaria*, Iredale (1954, p. 78) states that the shell of his species does not agree with the description of *latimanus* and "it is a smaller shell, with minor differences, than *hercules*, a Japanese species".

Unfortunately, Iredale does not give any reasons why his species does not agree with the description of *S. latimanus* or of *S. hercules*. Sasaki (1929, p. 179) was "greatly inclined to consider the species (*S. hercules*) to be identical with *Sepia latimanus*". Neither the description, nor the figures of *P. eclogaria* permit us to distinguish this species from *S. latimanus*.

According to Iredale (1954, p. 71) "the large Shark's Bay species was recorded by Meyer, without consideration, as *latimanus*, described from Dorey, west New Guinea, and this turns out to be very different, as was anticipated". Iredale does not mention if his opinion was based on a study of Meyer's material, for which he proposes a new name *Amplisepia parysatis* (see p. 38).

After having examined the specimens recorded by Chapman (1912, p. 11) from Torquay, Victoria, Iredale (1954, p. 70) states that "the 'plesiotype' of *latimanus* proves it to be a *Mesembrisepia* as above noted, the measurements, 139 by 47 mm, coming close again to *macandrewi*".

18. *Sepia apama* Gray, 1849 (Pl. 12, figs. 64-67; pl. 45, fig. 269)

Sepia apama Gray, 1849, p. 103; Tryon, 1879, p. 194; McCoy, 1888, pls. 188-190; Whitelegge, 1889, p. 282; Brazier, 1892, p. 11; Chapman, 1912, p. 23, pl. I; Suter, 1913, p. 1058, pls. 67, 68 & 69, fig. 1a; Hedley, 1918, p. M.33; Adam, 1939c, p. 51; Macpherson & Chapple, 1951, p. 156.

Lophosepion apama, Rochebrune, 1884, p. 92; Adam, 1944, p. 225.

? *Amplisepia verreauxi* Iredale, 1926, p. 194, pl. XXIII, figs. 1 & 2; 1954, p. 70; Iredale & McMichael, 1962, p. 98 (*non* Rochebrune, 1884).

Amplisepia apama, Iredale, 1926, p. 194; 1954, p. 70; Verco & Cotton, 1928, p. 127; Cotton, 1929, p. 90; 1931, p. 40, fig. 2; Hope MacPherson & Gabriel, 1962, p. 408.

Sepia (Amplisepia) apama, Cotton & Godfrey, 1940, p. 431, figs. 419 & 420.

? *Sepia palmata* Owen, 1881, p. 134, pls. XXIV & XXV; Brazier, 1892, p. 13; Adam, 1939c, p. 52.

? *Amplisepia palmata*, Iredale, 1954, p. 71.

? *Amplisepia parysatis* Iredale, 1954, p. 71, pl. IV, figs. 1 & 2.

Sepia sp. b. Voss, 1962, p. 3.

TYPE LOCALITIES: Port Adelaide (*S. apama*); Sydney (*A. verreauxi* Iredale); Norfolk Island (*S. palmata*); Shark's Bay (*A. parysatis*).

GEOGRAPHICAL DISTRIBUTION: Australia; ? New Zealand.

MATERIAL:

- a.* Port Adelaide, S. Australia; B.M. 1846.5.25.2.; 1 shell (holotype).
b. Hobson's Bay, Melbourne (McCoy); B.M. 1886.2.27.1; 1 shell.
c. Cobblers beach, Middle Harbour, Port Jackson (Coll. Brazier); B.M. 1890.6.21.1; 1 ♀.
d. Adelaide, 1953 (Coll. Kaspiew); Royal Institute of Natural Sciences, Brussels; 1 ♂, 3 shells.
e. Semaphore, S. Australia (Pres. Cotton); B.M. 1962259W; 2 shells.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex.	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
<i>c</i>	♀	300	78	48	42	42	100	13	45

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>c.</i>	♀	300	52	53	58	135	25	1.5	3.3

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L.in mm	W.	Th.	Str.z.	Spine	Observations
<i>a</i>	—	285	35	±10.5	±53	—	
<i>c</i>	♀	300	36	±10	58	—	pl. 12, figs. 64 & 65
<i>d</i>	♂	243	35.5	10	58	—	
	—	230	36.5	± 9	±65	—	
	—	210	39.5	± 8	±65	—	
	—	110	43.5	—	—	—	
<i>e</i>	—	215	37.5	10	61	—	
	—	97	45.5	9.3	53	2	pl. 12, figs. 66 & 67

DESCRIPTION: The shell has a long conical shape, being bluntly-rounded at its anterior margin and gradually acuminate at the posterior end. The dorsal surface shows a faint indication of three ribs in its posterior part, its anterior half is flatly convex; the posterior half is reticulate granulous, especially on the lateral portions. The anterior part is less granulous, being nearly smooth. Near the posterior end there is a slight indication of a spine which is completely hidden by the granulous covering. The ventral surface is rather convex in the anterior third; the striated area shows regularly convex striae and a shallow median groove which is more distinct near the posterior margin of the last loculus where the surface is convex on both sides of the groove. The inner cone consists of two portions: an inner one with narrow limbs and with a short narrow-angled V-shaped, posterior part of about 13 mm length and thick limbs limiting the posterior end of the striated area, and a much wider, completely flat portion with rather broad limbs, completely fused with the outer cone, and extending as a long bluntly-acuminate prolongation towards the posterior end. The outer cone is broad in the posterior third of the shell and completely surrounds the inner cone.

The shell of the female specimen (*c*) has broad chitinous margins in its anterior half (pl. 12, figs. 64 & 65). The ventral median groove is distinct for the whole length of the striated area which consists of two convex portions. The inner cone is finely granulous in its posterior, thickened, inner portion. The spine is still visible.

The body of this animal is broadly oval; the dorsal mantle-margin projects forward (broadly-convex) and the ventral margin is emarginate. The fins are very broad. Behind each eye there are three

flat, semicircular, membranous papillae of about 5–7 mm width. The arms are more or less distorted in spirit, but all appear to be keeled on their outer sides. The web is very high, except between the ventral arms; between the dorsal arms it reaches about half the arm-length and between the lateral ones up to two-thirds. The arm-suckers are relatively small and quadriserial; the distal ones have the distal half of their chitinous rings dentate with numerous, close-set, narrow teeth. The tentacular club has a swimming-membrane which extends on the stem for about the same length as the club. The dorsal protective membrane is distinctly detached from the stem; united with the ventral protective membrane it forms a broadly-oval sucker-bearing surface which is completely separated from the stem and connected with the latter by a thin membrane (Pl. 45, fig. 269). The suckers appear to be arranged in five longitudinal series, those of the median series being largest. The left tentacle shows an abnormal phenomenon, there being two small suckers on the stem near the base of the club. The smaller tentacular suckers have their chitinous rings finely dentate all around.

The male specimen (*d*) belonging to the Royal Institute of Natural Sciences (Brussels) is in rather poor condition. Its ventral arms are long and very stout compared with the other ones. On the distal half of these arms the protective membranes, especially the dorsal ones, are very broad and are reinforced with thick, transverse, muscular ridges. The left ventral arm is hectocotylized and possesses about eight transverse rows of four suckers at its base, followed by about the same number of rows of smaller suckers; the distal half of the arm is normal. In the shell of this specimen the spine is still visible and is not completely covered by the calcareous surface of the posterior part.

In two other shells from this locality the spine is completely hidden. The smaller of these specimens differs from the other shells in its more regular general form, the posterior part of the outer cone being much broader. The extreme posterior portion of this shell behind the striated area, is much more strongly curved towards the ventral side. These three shells have broad, chitinous margins in the anterior part of the dorsal surface.

In the collections of the Royal Institute of Natural Sciences (Brussels) there is a rather puzzling shell from Adelaide (Coll. Kaspiew), measuring 110×48 mm, which resembles *S. apama* in its broadly-rounded, anterior portion and its strongly-acuminated posterior half. Its dorsal surface is weakly convex, nearly flat anteriorly, more and more rounded posteriorly, with a slight indication of three ribs. It is faintly granulous in its anterior part and reticulate granulous posteriorly. The ventral surface is very flat, but the specimen being rather worn it is not possible to measure its exact thickness. The striated area shows a very shallow, broad, median groove, the striae being regularly convex. The inner cone has rather narrow limbs and in the posterior part their outer margin is flatly rounded. The posterior part of the inner cone is not drawn out as in *S. apama*, but in the inner angle of the inner cone there is the same thick, V-shaped formation as in this species. The outer cone is rather narrow, and only slightly continuous behind the inner cone.

There is no trace of a spine, but the posterior end shows a small, smooth, rounded knob. As young shells of *S. apama* have never been thoroughly described or figured, we could not decide if this shell belongs to *S. apama*. But the small shell from Semaphore, presented and identified by Cotton does not leave any doubt (pl. 12, figs. 66–67).

Compared with adult shells, the young shell is much less acuminate behind and is provided with a distinct short spine. The anterior portion of this shell is exactly like the adult shell—flattened, even somewhat concave, delicately granular, with a few linear furrows. The posterior part of the dorsal surface is coarsely granular with a reticulate pattern. The greater part of the ventral surface does not differ from the adult shell, the anterior portion of the striated area being flattened with a weak indication of a narrow median furrow. The posterior part shows marked differences. The inner cone is narrower, completely fused to the outer cone, but distinctly limited, cream-coloured, with a flattened, shiny outer margin, well distinct from the inner part of the lateral limbs which are deli-

cately striated longitudinally. The white V-shaped callous formation in the inner angle of the inner cone is much less developed than in the adult shells. The outer cone is slightly broader than the limbs of the inner cone; its posterior portion, separating the inner cone from the spine, is very short and radially striated, whereas it is very long and acuminate in larger specimens. The spine is short, stout, and straight, without any keels.

Finally, we received for identification a small immature specimen (M.L.d. = 38 mm) from S. Australia, belonging to the Academy of Natural Sciences of Philadelphia (No. 72732) and mentioned by Voss (1962, p. 3) as "*Sepia* sp b". The animal does not differ in any apparent respect from that of *S. bandensis* and without having examined the shell we should not have hesitated to identify it with that species. The dorsal mantle-margin has exactly the same rounded form, the tentacular club is exactly similar, the swimming-membrane extending beyond the base of the club, the protective membranes being fused at the base and separating the sucker-bearing surface from the stem. The unequal suckers seem to be arranged in five longitudinal series, but as in *S. bandensis* they probably constitute oblique series of eight in the middle of the club. Those of the third series are largest, those of the second one are somewhat smaller and those of the fourth one intermediate in size between those of the first and second series; the remaining, ventral ones are much smaller. Their chitinous rings have the same dentition of numerous partly-fused, fine denticles, like those of the arm-suckers but are more numerous.

But, although the animal is very like, and cannot be separated from *S. bandensis*, the shell proves that this specimen is a young *S. apama*. The shell is broadly rounded at the anterior margin and is narrower towards the posterior end. The dorsal surface is rather convex in the middle and is much flatter anteriorly, but it has strongly-sloping, flattish sides in the posterior portion, the central part of which forms a strongly convex rib. The anterior flat portion does not show any ribs—only a few radiating linear grooves. The surface is finely granulous in the anterior part, more and more coarsely granulous towards the posterior end, the granules being first arranged along the growth lines but form a reticulate pattern at the posterior end.

The ventral surface is very flat, the striated area having a faint linear median groove, and the last locus is broadly concave in the middle. The striae are convex towards the margins but nearly straight in the middle. A very narrow smooth zone separates the striated area on both sides from the outer cone. The inner cone is exactly the same as in *S. bandensis*, its lateral limbs are reflected and fused to the outer cone, its posterior part forming a narrow rounded rim around the posterior depression. The outer cone is continuous behind the inner cone as a narrow, radially-grooved ledge. A small spine is present, but rather worn.

At first view, this shell might be confused with that of *S. bandensis*, but the general form of the latter is more regularly oval, its whole dorsal surface convex and reticulate granulous, and there is no trace of a spine. The ventral surface is very similar, especially in the inner cone, but the outline of the striae is different and more regularly convex in *S. bandensis*.

The relative measurements of this immature shell of *S. apama* are: W = 49%, Th. = 10%, Str.z = 58%.

It is noteworthy that the inner cone does not show the inner thickened portion which is characteristic of larger shells.

REMARKS: The tentacular club of *S. apama* presents a very strong resemblance to that of *S. latimanus* (see p. 34) but the shell is quite different.

Iredale (1926, p. 194) created a new genus *Amplisepia* for *S. apama* Gray "whose sepioid differs entirely from that of the remainder of the Australian species yet known, save its eastern representative *A. verreauxi* Rochebrune". As Adam (1939c, p. 52; 1944, p. 229) pointed out and as we discuss on p. 47 of this report, Iredale was completely mistaken in describing Rochebrune's species, which is

synonymous with *Sepia mestus* Gray, as the eastern representative of *S. apama* Gray. In fact, Iredale (1926, p. 194, pl. XXIII, figs. 1 & 2) figured as *Amplisepia verreauxi* a shell which we are unable to distinguish from *S. apama*. According to Iredale (1926, p. 195) it "may be distinguished from the Adelaidean type by the narrower inner cone, the smaller phragmocone and the less prolonged mucronal area". In 1954 (p. 70) Iredale maintained his erroneous interpretation of *S. verreauxi* in stating that in *Amplisepia apama* "geographical variation can be seen, and the eastern form has been listed under the name *verreauxi*, but animals must be studied to substantiate the distinction". The animal from Port Jackson described above, does not substantiate this distinction.

As Adam (1939c, p. 53) pointed out, *Sepia palmata* Owen is probably identical with *S. apama*, but as Owen's material no longer exists, a conclusion cannot be drawn.

Finally, Iredale, (1954, p. 71, pl. IV, figs. 1 & 2) described a new species *Amplisepia parysatis* from W. Australia. According to the author it is the species which Meyer (1909, p. 331) recorded from Shark's Bay as *Sepia latimanus*. The new species is described as being "smaller, and at all stages a narrower shell, with the posterior end less developed, and retaining the spine until adult. It was mentioned in connexion with the introduction of *Mesembrisepia* that the development of that genus suggested a relationship with *Amplisepia*, and the juvenile of the present species is not unlike that of the western species of *Mesembrisepia*, occurring where the ranges overlap".

Compared with *S. apama* "it is a smaller species, notably narrower at every stage of growth, with the striated area less elevated anteriorly and more elevated posteriorly, the last loculus short and depressed. The outer cone is advanced and well calcified, a fairly large horny area being exposed laterally. The spine is always present, and there is no dorsal sculpture nor any ventral sulcus, although sometimes a faint ventral groove may be noticed". The author gives the following measurements: 160 × 58 mm (36.5%); 185 × 62 mm (33.5%); 187 × 70 mm (37.5%); 192 × 70 mm (36.5%); 195 × 70 mm (36%); 215 × 78 (36.5%), which proves that with one exception all these bones are relatively a little broader than the type of *Sepia apama* and certainly not "notably narrower".

The fact that the spine is present is of no value as the specimen from Port Jackson described above (pl. 12, figs. 64 & 65) still shows the spine.

As we have not seen any original material of the species it is difficult to take a decision, but we do not believe that *Amplisepia parysatis* is specifically different from *S. apama*.

19. *Sepia papuensis* Hoyle, 1885
(Pl. 12, figs. 68 & 69; pl. 42, fig. 250)

Sepia papuensis Hoyle, 1885, p. 197; 1886, p. 126, pl. 16, figs. 13-23; Brazier, 1892, p. 11; Joubin, 1897, p. 102; Appellöf, 1898, p. 561; Adam, 1939c, p. 85; Voss, 1963, p. 35.

TYPE LOCALITY: Challenger Sta. 188, 9°59'S., 139°42'E., Arafura Sea, S. of Papua, 28 fms., gn. m.

GEOGRAPHICAL DISTRIBUTION: Arafura Sea; Philippines; Ternate.

MATERIAL:

a. Syntype, Challenger Sta. 188, 10. ix.1874; B.M. 1889.4.24.68; 1 ♂.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♂	64	83	44	22	41	87	14	30

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♂	64	30	30	30	—	12.5	—	1.6

SHELL (IN % OF SHELL-LENGTH)

Loc.	Sex.	L. in mm	W.	Th.	Str.z.	Spine	Observation
a	♂	63	35	8	65	3.2	pl. 12, figs. 68 & 69

DESCRIPTION: Contrary to Hoyle's original statement, this specimen is a male with a well developed penis filled with spermatophores, but without any trace of hectocotylization.

We have only a few details to add to the original description.

The tentacular club (pl. 42, fig. 250) has a broad swimming-membrane, extending about one-third of the club-length beyond the base of the club. The protective membranes are narrow and fused at the base. The tentacular suckers are arranged in five longitudinal series, those of the middle one being largest, followed by those of the fourth series counted from the dorsal side.

The shell is oval, broadest anterior to the middle, bluntly rounded at the anterior end and acuminately rounded at the posterior one. The dorsal surface has three longitudinal ribs, separated by two grooves, covered with rounded tubercles arranged along the growth-lines; the chitinous margins are rather broad (pl. 12, figs. 68 & 69).

The ventral surface has a distinct median groove. The limbs of the inner cone are fused to the outer cone which forms a chitinous ledge surrounding the posterior excavation. The spine is nearly straight, with a ventral keel.

The specimen examined shows a few, irregularly-arranged, small, rounded, compressed, papillae on the dorsal and ventral surface of mantle and fins and also on the head. Similar papillae are more regularly arranged on some of the arms; on the dorsal, dorso-lateral and ventro-lateral arms they are situated on or near the outer keels, especially distally. On the ventral arms they are not found on the keels but are irregularly scattered on the dorsal surfaces. We do not consider that these papillae have any special taxonomic value.

REMARKS: According to Hoyle (1886, p. 128), "This species agrees very closely with *Sepia singaporensis* Pfeffer, as regards the soft parts, but the shell is broader at the anterior extremity and the spine cannot be said to be 'zurück gebogen', although it slopes gently upwards; it is also near to *Sepia plangon* Gray, which seems, however, to be still nearer to Dr Pfeffer's species".

In fact the shells of these species differ in many respects. In *S. papuensis* the anterior margin is rounded and in *S. recurvirostra* it is acuminate. In the first species the chitinous margins are rather broad in the anterior part and narrow in the second. The mid-dorsal rib is broad in the first one and narrow in the second. The base of the spine is covered by a glaze in *S. papuensis*, but not in *S. recurvirostra*.

The spine is nearly straight, with a ventral keel, in *S. papuensis*, while in *S. recurvirostra* it is distinctly curved upwards and without any keel. In the first species the striated area of the ventral surface is rather flattened but is still convex with a broad shallow groove in the middle, flanked by two low ribs; in the second it is flatter, with a very narrow median groove. The anterior part of the inner cone is similar in both species, the limbs being situated at the lateral margins of the striated area. But in *S. papuensis* the posterior part of the inner cone remains completely fused to the outer cone, the posterior part of which forms a chitinous ledge surrounding the posterior excavation. In *S. recurvirostra* the posterior part of the inner cone constitutes a distinct ledge, separated from the

low posterior margin of the outer cone, but the space between the two is filled with a callous-like substance which is emarginate anteriorly.

In both species the anterior part of the striated area is separated from the outer cone on both sides by a narrow smooth zone; in the posterior part, these smooth zones are covered by the widened and flattened parts of the inner cone.

We agree with Hoyle that *S. papuensis* is closely related to *S. plangon*, the animal does not show any noteworthy differences; but the shell is distinctly different (see p. 44).

Sepia papuensis seems to be also closely related to *S. galei* Meyer, 1909 (p. 332, figs. 4–6), from Sharks Bay near Brown Station on Dirk Hartog. Cotton (1929, p. 91) was of the opinion that "The characters of this peculiarly shaped species render its reference to any described genus difficult".

Unfortunately the tentacular club is unknown, but judging from the description and the figures of the shell it strongly resembles *S. papuensis* and may even be conspecific.

Solitosepia submestus Iredale, 1926a (p. 238, pl. XXXV, figs. 3 & 4) also seems to be little different. This species, from Masthead Island, was described as: "Shell smaller than average *S. mestus*, narrower, more elongate, inner cone more strongly marked, the outer cone passing ventrally in front of the spine and showing a depression which is filled with chitin; the dorsal surface flatter and the ray sculpture more defined."

According to Iredale (1954, p. 65) this species "has been since found in various forms throughout northern Australia, and the distinction of the forms will depend on study of the animals". Among these forms, Iredale mentions: *S. papuensis*, *S. galei* and *S. occidua*, "These are of the same type, but the western Australian form, *galei*, must be accepted at present, *occidua*, however, falling until animals are examined". In fact *Solitosepia occidua* Cotton, 1929 (p. 88, pl. XIV, figs. 1 & 2) from W. Australia, which has been also described from the south coast of Bali by Adam (1939c, p. 85), is probably identical with *S. papuensis*. In 1939, Adam (p. 86) expressed the opinion that *S. mestus*, *S. glauerti* and *S. occidua* might be identical.

After examining the type of *Sepia mestus* Gray (see p. 46) it seems probable that *Sepia mestus* Iredale (*non* Gray) and *S. glauerti* Cotton, are related or identical (see p. 47), but that *Sepia occidua* is distinct. This latter species has the inner cone completely fused to the outer cone, even in its posterior portion, the same as in *S. papuensis*, *S. galei* and ? *S. submestus*.

Iredale (1954, p. 66) mentions "a strange specimen, apparently referable to a distinct species, was secured at Low Isles; this measured 99 mm by 37 mm, but in addition to its greater breadth, it was dark coloured and coarsely pustulose, all the other Queensland bones being pale and finely pustulose, and definitely narrower", which he named *Solitosepia lana*, without any detailed description or figure.

Iredale concludes (1954, p. 66): "As for the consideration of these allied forms, it seems best to admit the named forms, *submestus*, *lana*, *galei* and *papuensis*, as species, in the super-species or group of *papuensis*." He regards *occidua* as a synonym of *galei*.

Unfortunately, with the exception of *S. lana*, Iredale does not give any noteworthy characters which permit us to distinguish these forms or species. He speaks about broader and narrower shells without keeping in mind that generally female bones are relatively broader than male bones, and young bones broader than old ones. The known measurements of these species differ only very slightly as regards the relative width of the shell: *papuensis*: 34–36%; *galei*: 33.5–34%; *submestus*: 35.5–41.5% (the latter figure representing a very small specimen of 24 × 10 mm); *occidua*: 37–39.5%; *lana*: 37.5%. The fact that Iredale (1954, p. 66) regards *S. occidua* identical with *S. galei* proves that the relative width cannot be used in this group. According to him, the inner cone of western bones seems to be consistently narrower than in the eastern bones, but the published figures do not show this difference.

Finally, Iredale (1954, p. 66, pl. V, figs. 17 & 18) described a new species, *Solitosepia genista*,

from Broome, N.W. Australia, which he first confused with *S. galei*. This new species has the shell "elongate, narrow, recalling *plangon* in appearance, the inner cone well developed, seen crossing but not obscuring the siphonal cavity, the ventral surface rather flattened, the striated area not deeply excavate, the last loculus long, no ventral sulcus, but a slight indication of a groove medially. The spine is keeled, a little recurved. The dorsal surface is rayed with three rays, forming a median strong rib with the outer radials weakly displayed. The outer cone is slightly calcified". The type measures 67×23 mm (34.5%) and consequently is relatively even broader than *galei*, but narrower than *occidua*; other specimens measured: 46×16 mm (34.5%), 59×23 mm (39%), and 69×22 mm (32%).

The published figures bear not the slightest resemblance to *S. plangon*. According to the author "it recalled *singaporensis*", which does not look at all like it. In his opinion "It is more like the narrow *papuensis*, but the inner cone is not produced". In the first place, *S. papuensis* is not narrower than *S. galei*, unless we consider *S. occidua* as synonymous with the latter (see p. 40) and, secondly, the inner cone of *S. papuensis* is completely fused to the outer cone and cannot be called "produced".

Without having seen original material we cannot decide in how far *S. genista* really differs from *S. papuensis*.

As we point out on p. 42, *S. prionota* Voss, 1962, is probably identical with *S. papuensis*, but we have to wait for the final description of the former species, the preliminary account of which is not sufficiently detailed to take a decision.¹

20. *Sepia prionota* Voss, 1962
(Pl. 4, figs 22 & 23; pl. 42, fig. 252)

Sepia prionota Voss, 1962a, p. 169; 1963, p. 24, pl. I, figs. f & g; text-figs. 1a-e.

TYPE LOCALITY: off Sirun Island, Sulu Archipelago, Tawi Tawi group, 44 m.

GEOGRAPHICAL DISTRIBUTION: Sulu Archipelago.

DESCRIPTION: This species is based on four females with a mantle-length of 26–61 mm. The original preliminary description does not give many details but the author has kindly put at our disposal some drawings and the photographic prints of the dorsal and ventral surface of the shell.

The mantle is rather slender, about half as wide as long. The dorsal margin projects strongly and is broadly rounded. The buccal membrane is devoid of suckers. The arms are in the order $4.1 = 2 = 3$, the ventral ones being about 34–40% of the mantle-length. All the arms are strongly compressed with "a keel on all but the ventral arms, consisting of a series of about 6–8 high rounded lappets originating at the base of the arms and extending to near the tip". The suckers are quadriserial on all the arms. The tentacles are stout, moderately long, and compressed.

The clubs are small and expanded; the suckers are arranged in six rows, four of the second dorsal row being greatly enlarged.

Judging from the figure, the swimming-membrane extends beyond the base of the club and the protective membranes seem to be fused at the base.

"The shell is narrow, rounded both anteriorly and posteriorly and with a short stout spine. The ventral surface is concave throughout." The photograph of the dorsal surface shows rather wide chitinous margins in the anterior portion; it is impossible to judge if there are any dorsal ribs or furrows. That of the ventral surface shows a long striated area with regularly convex striae and perhaps a faint, narrow, median groove. The limbs of the inner cone are well-developed and seem to

¹ Since the manuscript was set up in type we have examined a paratype of *S. prionota* and see no reason for keeping the two species separate.

be completely fused to the outer cone. The striated area appears to be separated from the latter by rather wide smooth zones. We do not know if the spine has any keels.

REMARKS: We have to wait for the more complete final description of this species to be able to discuss its relationship to other species. But as far as we can judge for the moment it does not seem to differ in any noteworthy respect from *S. papuensis* Hoyle, 1885 (see p. 41). According to Voss (1962, p. 170) the saw-like keels on the arms of *S. prionota* seem a sufficient character to separate this species from all others presently known from the Indo-Pacific region.

As we pointed out on p. 39, the type-specimen of *S. papuensis* also shows a number of papillae situated on, or near the outer keel of the dorsal, dorso-lateral and ventro-lateral arms. These papillae which were not mentioned in the original description are probably the same as the lappets described by Voss. The shells seem to be exactly alike, but the author did not state if the spine is keeled.

As the male specimen of *S. papuensis* does not show any trace of hectocotylization, we wonder if the female specimens reported for *S. prionota* are really all females; only by opening the mantle can this be verified.

21. *Sepia plangon* Gray, 1849
(Pl. 13, figs. 70-73; pl. 44, fig. 267)

Sepia plangon Gray, 1849, p. 104; Tryon, 1879, p. 194; Hoyle, 1886, p. 128; Brazier, 1892, p. 11; Hedley, 1918, p. M.33. *Acanthosepion plangon*, Rochebrune, 1884, p. 105; Adam, 1944, p. 231.

Solitosepia plangon, Iredale, 1926, p. 190, pl. XXIII, figs. 3 & 4; 1954, p. 66; Iredale & McMichael, 1962, p. 98.

Solitosepia plangon adhaesa Iredale, 1926a, p. 238.

? *Sepia cultrata* Hedley, 1918, p. M.33 (non Hoyle, 1886).

? *Sepia polynesica* Pfeffer, 1884, p. 11, figs. 14 & 14a.

TYPE LOCALITIES: Port Jackson, Australia (*Sepia plangon*); North-West Islet, Capricorn Group (*Sepia plangon adhaesa*).

GEOGRAPHICAL DISTRIBUTION: E. Australia; Lord Howe Island.

MATERIAL:

- a. Port Jackson (Robertson, Antarctic Expedition); B.M. 1963126W; 1 animal without shell (syntype).
- b. Australia (Sinclair); B.M. 1842.11.9.85; 1 shell, broken (syntype).
- c. Port Jackson, Australia (Antarctic Expedition, Admiralty); 1 ♂. B.M. 196374W.
- d. Port Jackson, Australia (Admiralty); 2 ♀ ♀. B.M. 196375W.
- e. Sow and Pigs Bank, Port Jackson, 3 fms. (Pres. Brazier); B.M. 1879.5.21.804; 1 young sp.
- f. Queensland, Caloundra, north of Brisbane (Iredale); B.M. 1915.8.28.1; 1 shell.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
c	♂	95	91	42	18	34	87	5.5	21 ⁺
d	♀	70	90	46	21	38	86	7	31
	♀	56	91	48	27	33	89	7	30

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>c</i>	♂	95	28	31	42	120	11.5	1.25	1.25
<i>d</i>	♀	70	29	34	39	—	—	1.30	—
	♀	56	27	27	39	—	—	1.10	—

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
<i>c</i>	♂	94	26	9	67	2.1 ⁺	
<i>d</i>	♀	69	28	9	67	1.4 ⁺	pl. 13, figs. 70 & 71
<i>f</i>	—	83	29.5	8	±69	6	pl. 13, figs. 72 & 73
Manly							
Beach		110	27				Iredale, 1926
Yeppoon		100	28				Iredale, 1954
?		135	26				"
?		39	33.5				"
?		42	33.5				"
?		48	32.5				"
?		59	32				"
?		61	31				"
?		72	30.5				"
?		73	29				"
?		77	30				"
?		82	29.5				"
?		83	30				"
<i>Sepia plangon adhaesa</i>							
North-west I.		88	29.5				Iredale, 1926a

DESCRIPTION: The type-specimen is greatly macerated, but its tentacular club (pl. 44, fig. 267) seems to be similar to that of *Sepia papuensis* Hoyle (see p. 39). Hoyle (1886, p. 128) described this specimen, the shell of which we were unable to find, but according to this author it "resembles that of *Sepia singaporensis* Pfeffer, more nearly than any other known to me; the only differences being that the incurving of the margins of the loculi in the striated area is a little more pronounced, and there is a ridge or keel on the ventral surface of the spine (as in *Sepia cultrata*) not recorded by Dr. Pfeffer. These two species are much alike, but they differ in the arrangement of the suckers on the tentacular club".

The other shell (*b*) mentioned by Gray (1849, p. 104) is broken but seems to possess a spine. There is a strong callus between the inner and the outer cone; the ventral surface has a deep median groove in the striated area, the striae forming a long, acutely-projecting angle.

In the male specimen from Port Jackson (*c*) the mantle is elongate-oval in shape with a projecting dorsal margin, reaching the mid-level of the eyes; it has a slightly concave ventral margin. The fins are narrow, not reaching the mantle-margin. The dorsal arms have poorly developed swimming membranes, the dorso-lateral and ventro-lateral ones are keeled at the outer sides and the ventral ones have well developed swimming-membranes. The suckers of the proximal two-thirds of the ventro-lateral arms have a greater diameter than on the other arms; all the suckers are quadriserial. The left ventral arm is hectocotylized, laterally compressed, with better developed protective membranes. The transformed portion is very little differentiated; at the base there are about five transverse series of normal suckers, followed by about five series of slightly smaller ones, especially on the dorsal side; the rest of the arm has suckers of normal size.

The tentacular club is exactly like that in *Sepia papuensis* (see p. 39), the sucker-bearing part being nearly completely detached from the stem by a deep groove between the stem and the dorsal protective membrane. The strongly developed swimming-membrane is slightly larger than that of *S. papuensis* and extends for about one third of the club-length beyond the base of the club. The suckers are arranged in five longitudinal series, those of the middle one being biggest, followed by those of the fourth series, counted from the dorsal side.

The shell is elongate, rounded at its posterior end and acuminate at the anterior one (pl. 13, figs. 70-73). The dorsal surface is finely granulous with two broad chitinous marginal portions, the median part showing a slight indication of three longitudinal ribs. The ventral surface has a long striated area, deeply hollowed out by a median groove which continues, less deeply, on the last loculus. The median groove is limited by two ribs giving a wavy appearance to the striae, which form a strongly acute projecting angle. The striated area is separated from the outer cone by two lateral zones which are slightly concave and transversely striated. The slightly raised limbs of the inner cone separate these lateral portions from the central area. In its posterior part the inner cone is broadened, flattened out and nearly completely fused with the outer cone, except at its posterior margin which is slightly raised into a ledge. This ledge is not free, but is connected to the outer cone by a thick blackish callus. The outer cone is widened in its posterior part and surrounds the inner cone with which it is connected by the callous substance which forms a posteriorly curved ledge. The spine is broken but shows a distinct ventral keel.

The female specimens (*d*) differ from the male in not having larger arm-suckers on the ventro-lateral arms. The buccal membrane is devoid of suckers.

REMARKS: Iredale (1926*a*, p. 238) described the subspecies *adhaesa* as follows:

"Shell narrower, more elongate, the inner cone more strongly developed, the outer cone advancing in front of the spine as a chitinous rim; the dorsal sculpture more pronounced and the dorsal surface more flattened than in the typical form."

According to Iredale this is "the species recorded by Hedley as *S. cultrata* Hoyle in error".

In 1954, Iredale (p. 66) considered *adhaesa* to be the northern form of *Sepia plangon*. In this text it is not clear which specimens he considers to belong to the sub-species, but he notes (p. 67) "that the northern bones of *plangon* (*adhaesa*) show a tendency to recurve the spine, whilst in the southern *plangon* the spine is very straight". In any case Iredale's own measurements show that *adhaesa* does not have a narrower shell, it is even slightly broader than the specimens from Port Jackson!

The animals of *Sepia plangon*, *S. recurvirostra* and *S. papuensis* are very much alike as regards the tentacular club. As to the shells of these species, they have much in common but there are several differences. On p. 39 we pointed out the differences between *S. papuensis* and *S. recurvirostra*. The shell of the latter resembles more nearly that of *S. plangon*, but the spine has no keel and the dorsal surface lacks the broad marginal chitinous zones whereas the outline of the striae of the ventral surface is completely different; *S. recurvirostra* lacks the deep median groove and hence the protruding angular form of the striae. The inner cone has the same general appearance, but in *S. recurvirostra* the posterior ledge is more elevated and less fused to the outer cone; the callous-like substance, uniting the inner and outer cone, is thick and anteriorly excavated, but in *S. plangon* it constitutes a thinner ledge-like formation which curves outwards posteriorly. It looks more like that of *S. papuensis*, but in that species it is a nearly straight, much thinner ledge. The general form of the shell and the outline of the ventral striae are completely different in *S. papuensis* and *S. plangon*.

As regards *S. polynesica* Pfeffer, 1884, the shell and the tentacular club of *S. plangon* are very like it. As the shell of *S. polynesica* could not be traced and the animal was badly macerated it is impossible to verify this question, but we are of the opinion that *S. polynesica* is identical with *S. plangon*.

22. *Sepia mestus* Gray, 1849

(Pl. 13, figs. 74 & 75; pl. 14, figs. 76–79; pl. 15, figs. 80–83; pl. 46, fig. 274)

Sepia mestus Gray, 1849, p. 108; Tryon, 1879, p. 197; Hoyle, 1886, p. 135, fig. 5; Brazier, 1892, p. 12; ? Tate & May, 1901, p. 351; ? Chapman, 1912, p. 25; Hedley, 1918, p. M.33; Adam, 1939c, pp. 52, 86.? *Solitosepia mestus*, Iredale, 1926, p. 189, pl. XXI, figs. 4 & 5; 1954, p. 65; Iredale & McMichael, 1962, p. 98.*Ascarosepion verreauxi* Rochebrune, 1884, p. 98, pl. V, fig. 2; Adam, 1944, p. 229.*Solitosepia liliana* Iredale, 1926, p. 188, pl. XXI, figs. 1–3; 1954, p. 64; Iredale & McMichael, 1962, p. 98.TYPE LOCALITIES: Australia (*Sepia mestus*); Sydney (*Ascarosepion verreauxi*); Manly Beach, N.S. Wales (*Solitosepia liliana*).

GEOGRAPHICAL DISTRIBUTION: Australia.

MATERIAL:

a. Australia (Sinclair); B.M.1842.11.9.54 and B.M. 1842.11.11.13; 2 shells (syntypes).

b. Caloundra, north of Brisbane, Queensland (Iredale); B.M.1915.8.28.2–3; 2 shells (with an annotation: "*Sepia* sp. allied to *S. mestus* Gray").

c. ? N. China (Purchased Jamrach); B.M. 1863.5.1.6; 1 ♀.

MEASUREMENTS:

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th. ¹	Str.z.	Spine	Observations
a	—	71	44+	7.7	±62	5	
		51	42	9.8	±59	5	pl. 14, figs. 76 & 77
b	—	91	48	7.1	±66	6	pl. 14, figs. 78 & 79
		64	52	8.6	±55	5.5+	pl. 15, figs. 80 & 81
c	♀	46.5	41	11	56	5.4	pl. 13, figs. 74 & 75

Comparative table of the measurements of the shells of different species allied to or identical with *Sepia mestus* (in % of shell-length).

Species	Locality	L. in mm	W.	Str.z.	Spine	Observations
<i>S. verreauxi</i>	Sydney	137	40	75	5	Type, pl. 15, figs. 82 & 83
<i>S. mestus</i>	N.S. Wales	57	37			Iredale, 1926, fig. ²
"	"	40	45			"
"	"	70	43			Iredale, 1954
"	Manly	92	42.5			"
"	Eden	87	42.5			"
"	Briby Isl.	90	44.5			"
"	?	24	50			"
"	?	40	45			"
"	?	55	43.5			"
"	?	63	39.5			"
"	?	69	39			"
"	?	90 ³	33.5			"
"	?	75	40			"
"	?	78	43.5			"
"	?	81	42			"
<i>S. liliana</i>	Manly Beach	114	44.5			Iredale, 1926

Table continued overleaf

¹ The thickness is measured in the median area, the outer margin being higher.² In 1954, Iredale (p. 65) stated that the dimensions were all given inaccurately in 1926, and that the average dimensions would be about 70 × 30 mm. The figure that Iredale published in 1926 (pl. XXI, figs. 4 & 5) shows a width of 38%.³ This may be a printing error for "70"; in that case the width would be 43%.

Species	Locality	L. in mm	W.	Str.z.	Spine	Observations
<i>S. liliana</i>	Manly Beach	90	50			Iredale, 1926
"	? "	138	47			Iredale, 1954
"	?	19	63			"
"	?	34	56			"
"	?	53	49			"
"	?	56	46.5			"
"	?	65	46			"
"	?	64	51.5			"
"	?	80	50			"
"	?	93	49.5			"
"	?	100	50			"
"	?	102	47			"
"	?	109	49.5			"
"	N. Queensland	38	53			"
"	"	56	53.5			"
"	"	82	47.5			"
"	Eden	119	49			"

DESCRIPTION: The animal of this species is not known for certain. Both the type shells are in rather good condition, although the ventral surface is rather worn (pl. 14, figs. 76 & 77). The shell is broadly oval, slightly acuminate at its anterior end and with a strong, ventrally-keeled posterior spine, which is directed slightly upwards in the smaller specimen.

The dorsal side is convex with an indistinct median rib. Nearly the whole surface is reticulate granulous. The ventral surface is very flat, the whole striated area concave and the last locus flat or slightly convex. Unfortunately this ventral surface is rather worn and does not show the exact outline of the striae which seem to be regularly rounded.

The limbs of the inner cone are very broad in the posterior half and are completely fused to the outer cone, with the exception of the outer margin which is slightly raised as a flat rim (approximately as in *Sepia savignyi*, but less developed).

The lateral parts of the outer cone are broad and continuous behind the inner cone as a very narrow margin. The spine has a strong wedge-like ventral keel.

Hoyle (1886, p. 135, fig. 5) published a drawing of one of the type shells, which shows a distinct narrow groove in the middle of the ventral surface. Actually both types do not show the slightest indication of such a groove.

The two shells from Caloundra (pl. 14, figs. 78 & 79; pl. 15, figs. 80 & 81) are broader than the type-shells but do not seem to differ in other respects. The larger one shows a very faint ventral median groove and in both there are some even fainter radiating grooves which give a slightly wavy outline to the striae.

The female specimen from N. China is in a rather poor macerated state and does not allow a detailed description. Its dorsal mantle-margin is well produced and rounded. The arms are short, the suckers quadriserial. The tentacular club (pl. 46, fig. 274) has a well developed swimming-membrane, about one and a half times as long as the club; the protective membranes remain separated at the base of the club.

The tentacular suckers seem to be arranged in five or six longitudinal series, but may in fact form oblique transverse rows of eight, the third row of suckers in the middle of the club being larger than the others.

The shell (pl. 13, figs. 74 & 75) does not show any noteworthy differences compared with those described above, except that the rim of the inner cone, is slightly narrower and also the ventral surface is less concave in the anterior portion of the striated area and practically flat, even convex at the margins.

As long as the animals of both the Australian and the Chinese specimens (if the last locality is exact) are not known or better known, this identification remains somewhat doubtful.

REMARKS: As the photographs of the type-specimen prove, there is not the slightest doubt that *Ascarosepion verreauxi* Rochebrune 1884, is identical with *Sepia mestus*. The animal of *S. verreauxi* which Adam re-examined (1944, p. 229) is in a poor state of preservation; its tentacular club shows five or six longitudinal series of small suckers, the median ones being larger than the others.

In 1939, Adam (p. 52) had already pointed out Iredale's mistake (1926, p. 194) in considering *Ascarosepion verreauxi* to be an *Amplisepia* allied to *A. apama* (Gray) and even to be the eastern representative of the latter. Adam's opinion was based on the original description and figures of *Ascarosepion verreauxi* and was substantiated by the study of the type-specimen (Adam, 1944, p. 229).

Unfortunately, Iredale ignored these publications and in 1954 (p. 71) still mentioned *verreauxi* as the eastern form of *Amplisepia apama*.

We hope that the reproduction of a photograph (pl. 15, figs. 82 & 83) of the type of *Ascarosepion verreauxi*, for which we are indebted to Professor Fischer-Piette (Paris), will put an end to this unbelievable confusion for good.

A second problem is that the specimens described and figured by Iredale (1926, p. 189, pl. XXI, figs. 4 & 5) as "*Solitosepia mestus*" do not seem to belong to this species, their general form and the outline of the striae of the striated area being quite different. On the other hand, the type-species of *Solitosepia*: *S. liliana* Iredale, 1926, resembles more closely the true *S. mestus* Gray. The specimens from Caloundra, described on page 46, belong without any doubt to *S. liliana*, but they only differ from the types of *S. mestus* in their slightly broader shape which is probably only a sexual character.

The genus *Ascarosepion* Rochebrune, 1884, was based on two species: the first mentioned being *A. verreauxi* Rochebrune, the second *A. fischeri* (Lafont, 1871); the latter is a form of *Sepia officinalis*, identical with *S. officinalis filliouxii* (see Cuénot, 1927, p. 273 and Adam, 1941, p. 88).

Considering *S. verreauxi* as the type-species of *Ascarosepion*¹ and as conspecific with *S. mestus* Gray (*non* Iredale) and with *S. liliana* Iredale, we may conclude that *Solitosepia* Iredale, 1926, is a synonym of *Ascarosepion* Rochebrune, 1884, the latter name having priority.

For the moment we cannot decide where the specimens mentioned by Iredale as *S. mestus* belong; their shell has a different form, a deeper ventro-median groove and an angular outline of the striae. They seem to resemble *S. glauerti* Cotton, 1929 (p. 87, pl. XIV, figs. 3 & 4), from Rottnest Island and Cottesloe, which Iredale (1954, p. 77) suggested to be an immature of a species of *Acanthosepion*. This is not possible because *S. glauerti* has a ventrally keeled spine.

Chapman's (1912, p. 25) statement that *Sepia mestus* Gray is a broad form of *S. cultrata* Hoyle is certainly erroneous (see p. 60).

Iredale (1926, p. 188) gave the following diagnosis of his genus *Solitosepia*: "Shell of medium size, the inner cone well developed, the spine keeled. While these features distinguish this group the members disagree in other details so much that the species may not prove congeneric later." We fully agree with the remark that the species placed in *Solitosepia* disagree in many details (see p. 105) but in our opinion the differences are not of a generic character and we disapprove of the splitting up of the genus *Sepia* without detailed study of both animals and shells.

We discuss the species classified by Iredale several times in this study. But there remains one species we were unable to retrace among our material: *Solitosepia rozella* Iredale, 1926 (p. 190, pl. XXI, figs. 6 & 7) and its sub-species *peregrina* Iredale, 1926a (p. 238). This species was described from Manly Beach, New South Wales; it is characterized by a deep median sulcus, an angular outline of the striae and a large, deep, rose-coloured inner cone, the dorsal surface is also rose coloured,

¹ Type-species designated by Hoyle (1910, p. 408). See p. 147 of this review.

finely pustulose, with three ribs. The sub-species, from North-West Islet, is smaller, comparatively broader, the inner cone is wider, the rose colour is restricted to a narrow band and the dorsal sculpture is more pronounced. The relative width of the shell of *S. rozella* varies between 31 and 44%, the smaller shells being relatively broader (Iredale, 1954, p. 67); the type of *peregrina* measured 89×34 mm (38%).

23. *Sepia novaehollandiae* Hoyle, 1909
(Pl. 15, figs. 84-90)

Sepia australis Férussac, 1835, pl. VII, fig. 4; d'Orbigny, 1845, p. 294; Férussac & d'Orbigny, 1848, p. 285, pl. VII, fig. 4; Hoyle, 1886, pp. 22, 220 (*non* Quoy & Gaimard, 1832).

Sepia novaehollandiae Hoyle, 1909, p. 266; Macpherson & Chapple, 1951, p. 156.

Mesembrisepia novaehollandiae, Iredale, 1926, p. 191; 1954, p. 68; Verco & Cotton, 1928, p. 127; Cotton, 1929, p. 88; 1931, p. 40, fig. 3; Hope Macpherson & Gabriel, 1962, p. 409.

Sepia (Mesembrisepia) novaehollandiae, Cotton & Godfrey, 1940, p. 428, figs. 416-418.

? *Sepia dannevigii* Berry, 1918, p. 264, figs. 51-55, pl. LXXIII, pl. LXXIV, figs. 1 & 2; Verco & Cotton, 1928, p. 127.

TYPE LOCALITY: Kangaroo Island, S. Australia.

GEOGRAPHICAL DISTRIBUTION: S. Australia; ? W. Australia.

MATERIAL:

a. Adelaide (Wigram); B.M. 1890.3.24.280-2; 3 shells.

b. Semaphore, S. Australia (Pres. Cotton); B.M. 1962256W.; 5 shells.

DESCRIPTION: The three shells (L = 42, 47 and 48 mm) from Adelaide correspond fairly well with Férussac & d'Orbigny's description and figures of their *Sepia australis* (*non* Quoy & Gaimard), with one exception—there is only a very faint indication of a ventro-median groove (pl. 15, figs. 84 & 85).

The dorsal surface has three very faint ribs; in the anterior portion the reticulate granulation is barely indicated but becomes more and more distinct in the posterior part, where the granules form long radiating tuberculous lines, except around the base of the spine, where they are round.

The spine is slightly turned upwards.

The ventral surface shows a long striated area; it is concave in its posterior part and a little convex anteriorly, with slightly convex striae. On both sides of the striated zone there is a narrow smooth area. The limbs of the inner cone are completely fused to the outer cone and surround a shallow posterior depression. The outer cone continues as a narrow margin behind the inner cone.

REMARKS: According to Cotton (1929, p. 88): "This appears to be the commonest and most variable species found in the Adelaidean region. Among hundreds of specimens from South and West Australia the numerous variants are not separable into any distinct varieties."

Cotton & Godfrey (1940, p. 428) described the animal of this species. The dorsal mantle-margin projects strongly. The arm-suckers are quadriserial. The tentacular club is small; its swimming-membrane extends beyond the base of the club and the suckers are "excessively numerous and minute, in 10 to 12 longitudinal series at the middle of the club". These authors consider *Sepia dannevigii* Berry to be synonymous with *S. novaehollandiae*.

Iredale (1926, p. 190) created a new genus *Mesembrisepia* for *M. macandrewi* n. sp. from New South Wales, which according to him (p. 191) is "the Peronian representative of *S. novaehollandiae* Hoyle, of which *S. chirotrema* Berry appears to be the benthal form".

Cotton (1929, p. 89) mentioned that this latter species "is easily distinguishable from *M. novae-hollandiae* (Hoyle) by the coarser sculpture of its dorsum, stronger spine, and deeper ventral sulcus.

It is probably the deeper water form of *M. novaehollandiae*, in which case it should be named *M. (novaehollandiae) chirotrema* Hoyle". Cotton & Godfrey (1940, p. 428) however state that *Sepia chirotrema* is "a distinct deep water species related to *S. (Mesembrisepia) novaehollandiae*", and they add: "A South African species *capensis* d'Orbigny = *australis* Quoy & Gaimard, is distinct but of the same sub-genus (Berry)."

As regards this latter statement, it is correct that Berry (1918, p. 275) compared *Sepia chirotrema* with *S. capensis* d'Orbigny (= *S. australis* Quoy & Gaimard), particularly because of "the strongly elaborated mechanism of the tentacle club". In fact, the tentacular club of *S. chirotrema* is even more like that of *S. tuberculata* and *S. papillata*, the protective membranes being united at the base.

But Berry pointed out several important differences and by no means concludes that the South African species belongs to the same sub-genus as *S. chirotrema* (this sub-genus had not yet been created by Iredale).

A much more serious question is the description mentioned above of the animal of *S. novaehollandiae*.

In fact, the description of the animal and the figures, given by Cotton & Godfrey (1940, p. 428, figs. 416 & 417) are textually copied from Berry's description and figures of *S. dannevigii* (1918, p. 264, figs. 54 & 55, pl. LXXIII, pl. LXXIV, figs. 1 & 2).

The shell of *S. novaehollandiae*, figured by Cotton & Godfrey (1940, fig. 418) does not belong to the animal represented in fig. 417, because Berry (1918, p. 265) stated: "Gladius (sepiostaire) unknown."

In his opinion this defeats "any possible attempt to identify it with any of the named forms heretofore known from the shell alone".

As not a single animal of *Sepia novaehollandiae* seems to have been described for certain, it is premature to consider *Sepia dannevigii* to be identical with it; in fact, we are almost certain that it is not.

We had the opportunity to examine five cuttlebones in the collections of the Royal Institute of Natural Sciences (Brussels) collected by Kaspiew in Adelaide (S. Australia). These shells seem to belong to *Sepia novaehollandiae*. The dorsal surface is faintly rose-coloured, especially in the posterior part and shows a very weak median rib. The chitinous margins are rather broad in the anterior part. The anterior portion is very finely granulous, the granules being more or less arranged along the growth-lines. In the posterior portion the granules are very coarse, partly arranged in longitudinal lines, radiating from the spine. The base of the spine is swollen on the dorsal side and provided with thick lateral ridges, which are partly covered with coarse radiating granules. The ventral surface is rather variable, with a more or less pronounced sulcus, the outline of the striae of the striated zone being strongly angular when the median groove is deep but less so when the latter is shallower and the shell flatter. The sulcus is limited by two more or less pronounced ribs, separating the median groove from the marginal areas which are flat or concave. The inner cone has rather broad limbs, which are completely fused to the outer cone, the posterior part being slightly raised as a rounded ridge. The outer cone is continuous as a thin chitinous margin in well preserved specimens, otherwise it seems to be interrupted between the inner cone and the spine. The latter is very strong, without any keels and straight or slightly turned upwards. There is a distinct depression at the ventral base of the spine.

The relative measurements of these shells are given in the following comparative table, in which we have assembled the data concerning the species regarded by Iredale (1954) as belonging to *Mesembrisepia*.

Of these five species only the animals of *S. irvingi* and *S. chirotrema* have been described. The tentacular club of the first one bears five rows of suckers, those of the median series being distinctly larger while those of the second dorsal series are slightly larger than the other ones; the protective

Locality	L. in mm	W.	Th.	Str.z.	Spine	Author
<i>Sepia novaehollandiae</i> Hoyle						
Adelaide (S. Australia)	125	32	12.0	64	5.6	this paper
(Coll. I.R.S.N.)	115	32	9.5	63	5.6	
	113	34	11.5	68	5.8	
	112	33	10.5	±62	5.8	
	111	35	11.5	68	5.8	
Kangaroo Island (S. Australia)	78	30				d'Orbigny, 1848
Cottesloe (W. Australia)	150	30	10			Cotton, 1929
Robe (S. Australia)	140	35.5				Cotton, 1931
<i>Sepia irvingi</i> Meyer						
Cockburn Sound (W. Australia)	115	35.5	11			Meyer, 1909
Point Cloates (W. Australia)	142	28	11			Iredale, 1954
Geraldton	130	31				"
	104	35.5				
	78	31				
	62	32				
Pelsart Island	173	26				
<i>Sepia macandrewi</i> (Iredale)						
Shellharbour (N.S. Wales)	170	33				Iredale, 1926
Stanley (N.W. Tasmania)	183	29				Iredale, 1954
	174	29				
	171	29				
	155	31.5				
	145	31				
<i>Sepia ostanes</i> (Iredale)						
Stanley (N.W. Tasmania)	140	35.5				Iredale, 1954
Marawah (W. Tasmania)	145	34.5				"
	128	35				"
Burnie (N.W. Tasmania)	130	37				"
Esperance (S.W. Australia)	110	33.5				"
	90	38				"
Perth	130	35.5				"
<i>Sepia chirotrema</i> Berry						
S. of Eucla (W. Australia)	168	30				Berry, 1918
Cottesloe and Rottnest Island						
(W. Australia)	145	29.5	9			Cotton, 1929
Robe (S. Australia)	160	26.5				Cotton, 1931
Joslin (S. Australia)	200	25				Iredale, 1954
Rottnest Island (W. Australia)	125	32				"
Geraldton	135	33.5				"
Nr. Cape Leeuwin	123	31.5				"
Pelsart Island	100	38				"

membranes seem to be separated at the base. The club of *S. chirotrema* is quite different. The swimming-membrane, which extends slightly beyond the base of the club is very broad. The protective membranes are fused at the base, the dorsal one "thick and fleshy, unique in not being everywhere continuous with the face of the club, but perforated by three large openings or fenestrae . . ." The suckers are very characteristic: at the base there are four or five of rather small ones, "one of them quite conspicuously (twice or thrice) larger than the remainder; succeeding these in centre of club proper, three gigantic suckers, the middle one is largest, borne on long pedicels originating in three large pockets just opposite the fenestrae in the dorsal membrane; flanking these and alternating with them by reason of being borne on the inner face of the dorsal membrane (one respectively just above each supporting pillar) are two suckers rather smaller than the largest of the proximal group; two fleshy folds springing from the dorsal membrane, one below each of these suckers, traverse the face of the club and are continuous with similar ridges forming the supports of the ventral membrane,

finally terminating near the margin of the said membrane in three small diverging buttresses; springing from the two angles of these buttresses, two very small suckers borne by each ventral ridge, or four suckers in all in the ventral row, each pair thus corresponding to a single dorsal sucker". The author rightly concludes that although the suckers on the main part of the club seem to be arranged in three rows, they are actually in four rows. The distal fourth of the club bears 40-48 crowded small suckers in four to six series.

If the structure of the tentacular club has any systematic value, and in our opinion, it certainly has, we do not think that it is justifiable to place two species as different in this respect as *Sepia irvingi* and *S. chirotrema* in one special genus, *Mesembrisepia* Iredale, 1926, separated from other Sepiidae. As we mentioned above, Iredale (1926, p. 190) created this genus for his *Mesembrisepia macandrewi*, and stated:

"The development of the spine is the characteristic feature in which it differs from *Solitosepia* and suggests a relationship with *Amplisepia*, which may be later discussed. The shell is large for the medium series, elongately oval, inner cone well marked and lengthened, spine round and almost pinched off and directed ventrally."

We do not know which relationship with *Amplisepia* the author had in view, because he does not mention it in discussing this other genus.

Unfortunately the original figure of the cuttlebone of *Sepia chirotrema* (see Berry, 1918, p. 271, figs. 58 & 59) is not very clear and partially reconstructed, the spine seems to be incomplete and the author (p. 272) describes it as short, stout and blunt, without mentioning if it is keeled or not.

Cotton & Godfrey (1940, p. 422, figs. 410-415) have described and figured this species. Unfortunately their description of the animal and the shell is an abbreviated copy of the original description, the figures of the animal are copied from Berry's original figures (pl. LXXIV, figs. 3, 5, 6-9, pl. LXXV-LXXVII; text-figs. 60 & 61), but their figure of the shell (fig. 413) is quite different from the original one and we are not even sure that it belongs to *S. chirotrema*. It is apparently related to the other species of *Mesembrisepia* but seems to be characterized by the very narrow general form and the pronounced wing-like formation of the posterior part of the outer cone.

As to the other species described or mentioned by Iredale (1926, and 1954) as belonging to *Mesembrisepia*, we know nothing about the animals and we have to rely on his descriptions and his figures of the shells.

If the shells we described from Adelaide (S. Australia) are really *Sepia novaehollandiae* Hoyle, the width of the shell of this species varies between 30 and 35% of the length.

Iredale (1954, p. 68) states under *Mesembrisepia novaehollandiae*: "The New South Wales representative, *macandrewi* is a broader shell, and there is a slight variation, which may be sexual, in the breadth." But according to his own figures, the type of *M. macandrewi* has a width of 33% and he mentions (p. 70) a series from Stanley, north-west Tasmania, which recall this species, but are a little narrower, their width varies between 29 and 31.5%. On the other hand, he states that:—

"it may be found on the eastern Victoria coast, and to the north and east of Tasmania, but the bones from north-west and west of Tasmania are broader, and represent a different form.

The western Victoria bones may be *novaehollandiae*, or an intermediate form."

Finally the author mentions that the bone which Chapman (1912, p. 25) reported from Torquay (Victoria) as being *Sepia latimanus* Quoy & Gaimard, is of a *novaehollandiae* form, judging by the figure. This bone measured 135 mm in length, and not 138 mm as Iredale mentioned. All these remarks under *M. macandrewi* are rather confusing and the relative figures of our comparative table (p. 50) show that if the width of the shell is the only distinctive difference between *M. novaehollandiae* and *M. macandrewi*, there is no difference at all.

As for *Sepia irvingi* Meyer, 1909, Cotton (1929, p. 91) was of the opinion that this species "is

possibly a variant of *Mesembrisepia novaehollandiae* Hoyle". In fact this species seems to be absolutely identical with the above mentioned shells from Adelaide. The width of the shell of a female-type specimen measures 35.5% of the length.

Nevertheless, Iredale (1954, p. 69) pretends that: "the Western Australian bones, north of the Swan River, are constant enough, in their narrowness and prominent ventral surface anteriorly, to be admitted as different." He concludes that the western name (*S. irvingi*) may be used for these bones until the matter is decided by study of animals.

Among the shells Iredale attributes to *S. irvingi* two have a width of 26 and 28%, the other ones vary between 31 and 35.5%, which proves that in the mean *S. irvingi* is not narrower than *S. novae-hollandiae* and both may even be broader than *S. macandrewi*.

Mesembrisepia ostanes Iredale, 1954, seems to have a slightly broader shell (see p. 50), "with anterior ventral shallow, not elevated", showing a round depression. According to the author "the difference is too marked to be sexual". We do not understand why this character could not be a sexual one. This species (?) is found along the southern coast of Australia, and round the south-west corner of W. Australia as far as Swan River.

Finally Iredale mentions a series of *Mesembrisepia* from north Tasmania "becoming very near to *macandrewi*, but not reaching its size". The width of these shells varies between 31 and 37%, their length between 110 and 150 mm.

We do not know whether the specimens of *Sepia chirotrema* mentioned by Cotton (1929 and 1931) and by Iredale (1954, p. 70) really belong to this species. But it is noteworthy that their relative width varies from 25 to 38%.

Without a thorough study of a great number of animals and shells of different sexes and sizes it is impossible to come to a conclusion but we suppose that all Iredale's species belong to *Sepia novae-hollandiae* and we are almost convinced that *Sepia chirotrema* Berry is a completely different species, not even related to the former.

After having completed this text, we had the opportunity to examine five shells from Semaphore, S. Australia (B.M. 1962256W. 1-5) which belong without any doubt to *Sepia novaehollandiae*.

The shells present the following relative measurements:—

No.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
1.	? ♀	122	36	9.8	75	4.1	pl. 15, figs. 87 & 88
2	? ♂	122	31	11	±61	4.9	pl. 15, figs. 89 & 90
3	? ♀	112	37.5	10.1	74	3.1	
4	? ♂	91	35	11	59	4.4	
5	? ♀	86	36	10.5	61	3.5 ⁺	

They show two forms which in our opinion represent the two sexes, but more material is needed to substantiate this belief. Numbers 1, 3 and 5, which probably belong to females, are relatively broader and flatter with a longer striated area, which shows a broader, relatively shallower median groove.

The dorsal surface which is more or less rose-coloured, especially in its posterior part, has three longitudinal ribs, more or less well-defined; the width of the median rib varies a good deal. The anterior part is delicately granulous, the posterior part strongly rugose, the granules forming radiating ridges in the median portion. The width of the chitinous margins of the anterior part is variable. The base of the spine forms two thick lateral expansions and is well set off against the rugose posterior portion of the shell. The strong spine, devoid of any keels, is straight in the narrow specimens (♂ ?) and turned upwards in the broader ones (♀ ?), but we do not know if this character is constant. If

our hypothesis is confirmed, the five shells from Adelaide (I.R.S.N.), mentioned in the comparative table (p. 50) are probably males.

The ventral surface shows that the striated area is longer in the broader shells, with a wider median groove and the rounded ribs limiting it are more widely apart. Hence the outline of the striae is different, projecting anteriorly more in the middle, in the narrow shells. The striated area is separated from the outer cone by two narrow smooth zones. The inner cone is completely fused to the outer one, its posterior portion slightly thicker, surrounding a weak depression. In most specimens the outer cone seems to be interrupted between the inner cone and the spine, but in fact it is continuous as a narrow border. The thick base of the spine is hollowed out in the centre and shows a radiating striation.

24. *Sepia acuminata* Smith, 1916.
(Pl. 16, figs. 91 & 92; pl. 43, fig. 261)

Sepia acuminata Smith, 1916, p. 21, pl. II, figs. 3 & 4; Tomlin, 1923, p. 40; Robson, 1924, p. 12; Massy, 1928, p. 91, pl. VIII, figs. 1-7; Turton, 1932, p. 1.

Rhombosepion acuminata, Robson, 1924a, p. 643.

Sepia sp. A (pars) Robson, 1924, p. 13.

TYPE LOCALITIES: Port Elizabeth; Tongaat Beach, Natal.

GEOGRAPHICAL DISTRIBUTION: South Africa.

MATERIAL:

- a. Port Elizabeth (Ponsonby); B.M. 1890.9.22.332-3; 2 shells (syntypes).
- b. Port Elizabeth (Spencer); B.M. 1890.12.14.34; 1 shell.
- c. Tongaat Beach, Natal (Burnup); B.M. 1920.3.23.2-4; 3 shells.
- d. Natal: Sta. 95, 45 fms.¹ (♀); Sta. 103, 160 fms. (♂) (Mar. Biol. Surv. South Africa, Coll. Gilchrist, det. Robson); B.M. 1924.9.9.72-3; 1 ♂, 1 ♀, 2 shells (one of these shells, which is in rather poor condition, must belong to the ♀; Under the same registered number there is a third dry shell, labelled "*S. acuminata*, juv. No. 109" by Robson; this seems to belong to *Sepia hieronis*, being more elevated, with a distinct median groove and the limbs of the inner cone practically at the base of the outer cone; it has no spine at all and a broad portion of the outer cone surrounds the inner one).
- e. Port Elizabeth; B.M. 1952.11.24.1; 1 shell.
- f. Isipingo; B.M. 1952.11.24.2; 1 shell.
- g. Univ. Cape Town Ecol. Surv., Afr. 1051 K; B.M. 196376W; 1 ♂ ($L_M = 78$ mm).
- ? h. Mombasa (Coll. Selfe, Kenya); 3 broken shells. B.M. 196377W.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
d	♀	79	83	53	29	40	89	11	32
	♂	67	78	49	25	36	87	9	25
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
d	♀	79	32	32	35	95	13	1.26	0.38
	♂	67	27	28	33	105	13	1.04	0.37

¹ According to Barnard (*in litt.*) the exact localities are: Sta. 95, 29°52'S., 31°17'E., 192 fms.; Sta. 103: 29°54'S., 31°15'E.; 160 fms.

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
<i>b</i>	—	109	40	10.1	63	5.5	pl. 16, figs. 91 & 92
<i>a</i>	—	104	36	9.1	64	6.7	
<i>e</i>	—	104	38	9.6	65	6.7	
<i>c</i>	—	100	38	9.8	70	5.5	
<i>d</i>	—	74	41	9.9	61	—	
<i>f</i>	—	64	44	10.2	58	7.0	
<i>d</i>	♂	63	44	11.1	65	—	
<i>c</i>	—	50	44	10.6	54	6.0	
<i>c</i>	—	31	48	9.7	52	6.4	

DESCRIPTION: The dorsal mantle-margin projects forward; this projection being broadly triangular.

The dorsal arms are externally rounded, the dorso-lateral ones have distinct outer keels and flattened ventral sides, the ventro-lateral ones have stronger outer keels and still flatter ventral sides, while the ventral ones have strong outer swimming-membranes. All the arms possess wide protective membranes. The arm-suckers are quadriserial; the proximal ones have almost smooth chitinous rings and the more distal ones have close-set sharp teeth, especially at the distal margins.

The buccal membrane is connected to the arms by strong attachments. The pouches between the arms and the buccal membrane are particularly wide and deep. There are six of them, one opposite each of the dorsal arms, one opposite the two lateral arms and one opposite each of the ventral ones. The interbrachial web is well developed and is highest between the dorsal arms.

The tentacular stem is triangular in cross-section; it is keeled on the outer side and flattened on the inner one, with two lateral ridges, these being the continuation of the protective membranes of the club. The swimming-membrane is well developed and extends beyond the base of the club for a distance of about half the length of the club. The protective membranes are wide and are separated at the base of the club. The minute, sub-equal, long-stalked suckers are arranged in about 8–10 series. At the distal end of the club there are the two slightly larger suckers we find in most species; these are covered by a thick fleshy flap (pl. 43, fig. 261).

The left ventral arm of the male is hectocotylized. It has about six transverse rows of normal suckers at the base. The transformed portion is narrow and long (6 mm) with about nine series of much smaller suckers. The two ventral longitudinal series are close together and form practically one single series of 18 close-set suckers. These are separated from the dorsal ones by a thick fleshy ridge. The dorsal suckers form two separate series of widely-spaced suckers which are smaller than the ventral ones in the greater part of the hectocotylized portion.

The shell is rhomboidal, broadest in the middle, being acuminate at both ends (pl. 16, figs. 91 & 92). The dorsal surface is salmon-coloured, with a distinct median rib, a faint indication of two lateral ribs and broad chitinous margins.

The ventral surface is flat, the striated zone with a very faint indication of a median and some other linear furrows. The striae are regularly convex in the posterior part and slightly angular near the anterior end. The striated zone is separated from the outer cone by two narrow, nearly-smooth areas. The inner cone has a slightly raised, rounded posterior ridge, surrounding a shallow posterior pit. The lateral limbs are very narrow, situated in the middle of the smooth marginal areas or near the base of the outer cone. The latter is broad, surrounding the whole inner cone and forming a chitinous ledge in its posterior part, with slight radial ribs between the inner cone and the spine. The spine is devoid of keels; it is straight or slightly curved upwards.

REMARKS: Among some broken shells from Mombasa (*h*) are three incomplete bones which resemble *Sepia acuminata* very much; their dorsal surface has the same salmon colour, granulation and broad chitinous margins, but instead of the mid-dorsal rib there is a deep narrow groove. As the posterior end is lacking, we cannot describe these shells in detail. Complete specimens are needed before we can decide if these shells really belong to *Sepia acuminata*.

According to Smith (1916, p. 21): "A small specimen, 35 mm in length, described by Dr. G. Pfeffer as *S. venusta* (= *venustoides* Hoyle) from Zanzibar apparently closely resembles the young of this species." As we pointed out on p. 25, Pfeffer's species has a different tentacular club and belongs rather to *Sepia pharaonis*.

Sepia acuminata seems to be closely related to *S. madokai* and to *S. rex* (see p. 56).

25. *Sepia jaenschi* (Cotton, 1931)
(Pl. 16, figs. 93 & 94)

Decorisepia jaenschi Cotton, 1931, p. 41, figs. 5 & 6.

Sepia (*Decorisepia*) *jaenschi*, Cotton & Godfrey, 1940, p. 439, fig. 427.

TYPE LOCALITY: Robe, S. Australia.

GEOGRAPHICAL DISTRIBUTION: Robe; Port Fairy, Victoria.

MATERIAL:

a. Robe, S. Australia (Pres. Cotton); B.M. 1962258W; 1 shell.

MEASUREMENTS:

SHELLS (IN % OF SHELL-LENGTH)

Species	Locality	L. in mm	W.	Th.	Str.z.	Spine	Observations
<i>S. jaenschi</i>	Robe	103.5	36	8.4	—	—	Holotype
"	"	112	28.5 ⁺	8.3	71	3.6 ⁺	Spec. <i>a.</i> pl. 16, figs. 93 & 94
<i>S. cottesloensis</i>	Cottesloe	42.6	43	10.5	—	—	Holotype
<i>S. rex</i>	Manly Beach	119	33.5	—	—	—	Holotype
"	N. Tasmania	50	40	—	—	—	Iredale, 1954, p. 69
"	"	90	33.5	—	—	—	"
"	"	111	36	—	—	—	"
"	"	118	34	—	—	—	"
"	"	123	34	—	—	—	"
"	E. Victoria	28	46.5	—	—	—	" , p. 70
"	"	54	40.5	—	—	—	"
"	"	57	40.5	—	—	—	"
"	"	64	40.5	—	—	—	"
"	"	76	38	—	—	—	"
"	"	105	37	—	—	—	"
"	"	117	37	—	—	—	"
"	"	124	36.5	—	—	—	"
"	Torquay, Victoria	120	38.5	8.7	—	5.4	" , p. 72
"	N.S. Wales	127	34	—	—	—	"
"	"	124	38	—	—	—	"
"	Capricorn Group	140-150	35.5-33.5	—	—	—	"

DESCRIPTION: The only specimen we have examined is the shell presented to the British Museum and identified by Cotton (pl. 16, figs. 93 & 94). It is rather damaged and the exact width and the form of the posterior part of the outer cone cannot be properly described. It is in any case much narrower than the holotype. It is elongate oval and strongly acuminate at the anterior end. The dorsal

surface is rose-coloured, with three longitudinal ribs separated by two, narrow, well limited furrows. The median rib is finely granular with the rest of the dorsal surface more coarsely granular, especially in the lateral parts where the granules form longitudinal series in the anterior half of the shell and a more reticulate pattern in the posterior portion. The extreme posterior part, near the spine, is smooth and glossy. The rounded spine is turned upwards.

The ventral surface is rather flat with a narrow, shallow, median groove over its whole length. The striae are slightly convex in the posterior part, more and more reversed V-shaped towards the last loculus. The median groove is flanked by two low ribs. The striated area is separated from the outer cone by two narrow smooth zones. The inner cone has very narrow limbs which form a rounded ridge surrounding the posterior portion of the striated area. In its posterior part and partly on the sides, this ridge overhangs the striated area slightly, leaving a narrow cleft between the former and the latter. From the rounded ridge, which in the anterior part of its limbs separates the striated area from the narrow smooth zones, extends irregularly a flatter part which is completely fused to the outer cone. The latter is much too damaged to be properly described.

REMARKS: Without Cotton's identification of this specimen, we should have hesitated to consider it as *Sepia jaenschi* Cotton.

The figure of the holotype, reproduced by Cotton & Godfrey (1940, p. 439, fig. 427) shows a much broader shell, which, according to the text, has no ventral sulcus, although the figure indicates it. According to the diagnosis of *Decorisepia* the inner cone is absent, but on the next page the authors describe it as "obsolete". In fact, the inner cone is narrow but that it exists there is no doubt.

We have never seen the second species described by Cotton: *Decorisepia cottesloensis* (1929, p. 90, pl. XVI, figs. 1 & 2) which has a relatively much broader shell, but as it is also much smaller this is probably a juvenile character. Its general form strongly resembles that of *Sepia rostrata* Férussac & d'Orbigny (1835, pl. 8, fig. 6) (*non* Férussac & d'Orbigny, 1848, p. 284, pl. 26), but the inner cone seems to be quite different.

Iredale (1926, p. 193, pl. XXII, figs. 9 & 10) has described *Decorisepia rex*, the type-species of this genus, which is characterized as lacking the inner cone, from New South Wales. In the original description it is stated that this species has no ventral sulcus, but the figure shows it very clearly. According to Iredale (1954, p. 70) the specimen from Torquay, Victoria (see table of measurements) recorded by Chapman (1912, p. 24, pl. I) as being "*Sepia capensis* d'Orbigny", belongs to *Decorisepia rex*. In his later paper Iredale (1954, p. 72) mentions under *S. rex* that "similar shells have been named *jaenschi* from Western Victoria and South Australia, and another shell from Rottnest Island, Western Australia, *cottesloensis*". It is not clear from his text if he considers these two species as specifically different from *S. rex*. As we have only seen a single shell of *S. jaenschi*, we prefer not to take a final decision, but we are strongly inclined to believe that they all belong to a single species: *S. rex* Iredale, 1926. Garrard (1961, p. 36) mentions two live specimens of the latter species, captured in 76–80 fms. east of Lake Macquarie, but does not describe them.

As to the relations of this latter species with species from other parts of the Indo-Pacific, the shells of *S. acuminata* (pl. 16, fig. 75) and *S. madokai* Adam, 1939 (= *S. robsoni* Sasaki, 1929, *non* Massy, 1927) are very much alike. The former, from S. Africa, shows exactly the same general outline and the same ventral aspect as the holotype of *S. jaenschi*, but the longitudinal ribs of the dorsal surface are somewhat less pronounced than in the above described specimen of that species. As to *S. madokai*, from Japan, we have not examined any material and we can only refer to Sasaki's description and figures (1929, p. 179, pl. XVII, figs. 2 & 3). The figured shell measures 62 × 23.4 mm (W. = 37.5%) and the description does not reveal any character which permits us to distinguish it from *S. jaenschi*.

When compared with Sasaki's description of *S. madokai*, the animal of *S. acuminata* does not

seem to differ from it in any respect. The two species seem to be closely related or may perhaps be identical.

26. *Sepia bertheloti* d'Orbigny, 1838
(Pl. 16, figs. 95-98)

Sepia bertheloti d'Orbigny, 1838, p. 21, pl. II; Férussac & d'Orbigny, 1848, p. 274, pls. 11, 23; Adam, 1941, p. 109, pl. IV, fig. 2; 1951, p. 772; 1952, p. 15, figs. 4-6, pl. I, figs. 3 & 4; 1960a, p. 465; 1961, p. 227; 1962, p. 13.
Acanthosepion bertheloti, Rochebrune, 1884, p. 106; Adam, 1944, p. 232.
Sepia verrucosa, Lönnberg, 1896, p. 697 (*non* Bellardi, 1872).
Sepia (Acanthosepia) mercatoris Adam, 1937, p. 56, figs. 6-10.

TYPE LOCALITIES: Teneriffe, Canary Islands (*S. bertheloti* and *S. verrucosa*), Rufisque (*S. mercatoris*).

GEOGRAPHICAL DISTRIBUTION: West Africa, from Teneriffe to Angola (Tiger Bay).

DESCRIPTION: We have not studied the material of this species in the collections of the British Museum, but as the southern limit of many West African species is not known because of insufficient collecting, we give a short description of *Sepia bertheloti* from Adam's report (1952, p. 15) which was based on 200 specimens.

Until now it has been collected in depths varying between 20 and 156 m and it seems to be more sub-littoral than *Sepia officinalis hierredda* (p. 32).

The mantle is more than twice as long as broad; its dorsal margin projects strongly in a long, sharp angle, while the ventral margin is slightly emarginate. Both males and females have a series of elongate tubercles at the base of the fins and, outside of these tubercles, numerous, small, light-coloured, round patches, which are more pronounced in the males, who have, moreover, a narrow, reddish streak near the free margin of the fins.

The longest male observed, measured 171 mm in dorsal mantle-length and the longest female was 134 mm.

The relative measurements differ much more according to the sexes than in *S. officinalis hierredda*. The mantle is wider in the female while the arms are much longer in the male, especially the ventral ones, which attain more than 50% of the mantle-length. These measurements were all based on preserved animals; according to Rancurel (Abidjan), in a verbal communication to Adam, all the arms in both males and females are much longer in fresh animals and seem to undergo considerable contraction during fixation. All the arms are laterally compressed, keeled on their outer sides. The globular suckers are quadriserial, the median ones having a slightly greater diameter than the lateral ones.

The tentacular club is rather slender; its swimming-membrane does not extend beyond the base, the protective membranes are separated at the base and do not continue down the stem. The unequal tentacular suckers are apparently arranged in five or six series, but in fact they form oblique transverse rows of eight, the third sucker of each row being the largest. The arrangement of these suckers recalls that of *S. officinalis* but those of *S. bertheloti* are not so unequal and are much smaller; they hardly exceed the size of the arm-suckers.

The left ventral arm of the male is hectocotylized in its proximal third, which bears a few normal suckers at its base, followed by 9 to 13 transverse rows of minute, spaced, suckers. The dorsal protective membrane is very broad, almost completely covering the suckers.

The female has a pair of receptacula seminis in the ventral part of its buccal membrane.

The shell is elongate oval, its width measuring 23.5-30.5% in the male, 26-33.5% in the females and has a thickness 8.5-11.5% in both sexes (pl. 16, figs. 95 & 98). The dorsal surface has a median rib and is finely rugose, the tubercles being arranged in longitudinal series in the lateral parts. The

posterior portion is covered by a glaze-like substance which does not cover the strong spine; the latter is devoid of keels. The ventral surface is slightly convex, with a faint median furrow. The striae of the long striated area are convex with a small indentation in the middle.

Even in the small specimens the length of the striated area exceeds half the shell-length and may even attain 70–80% in the longest specimens.

The inner cone has narrow, slightly-rounded limbs, its posterior part being somewhat wider and flattened. The outer cone is continuous behind the inner one.

Young females of a mantle-length of 50 mm are already mature, the size of their eggs does not differ from that of the largest females.

REMARKS: The animals of this species are not easily distinguished from *S. officinalis*, although the ventral arms of the male are much longer and the largest tentacular suckers relatively smaller. But the shell is very characteristic and does not resemble that of any other species.

27. *Sepia cultrata* Hoyle, 1885
(Pl. 17, figs. 99 & 100)

Sepia cultrata Hoyle, 1885, p. 198; 1885a, p. 303; 1886, p. 133, pl. XX; Whitelegge, 1889, p. 282; Brazier, 1892, p. 12; Chapman, 1912, p. 25; ? Hedley, 1918, p. M.33.

Sepia capensis var. Gray, 1849, p. 110 (*non* d'Orbigny, 1835).

Glyptosepia cultrata, Iredale, 1926, p. 192, pl. XXII, figs. 5 & 6; 1954, p. 73; Garrard, 1961, p. 36; Iredale & McMichael, 1962, p. 99.

? *Glyptosepia macilenta* Iredale, 1926, p. 192, pl. XXII, figs. 3 & 4; 1954, p. 73; 1955, pp. 78–79.

TYPE LOCALITY: off Twofold Bay, Australia.

GEOGRAPHICAL DISTRIBUTION: New South Wales. Garrard (1961, p. 36) mentions the capture of two live specimens in 156–160 fms. east of Newcastle.

MATERIAL:

a. Challenger Sta. 163 A, off Twofold Bay, Australia, 36°59'S., 150°20'E.

4.Mar.1874, 150 fms., gn. m., B.M. 1889.4.24.75; 1 ♀ (holotype).

b. Sydney (Edwards); B.M.1837.5.13.44. (det. Gray, 1849 as *Sepia capensis* var.); 1 shell.

c. Australia (Sinclair); 1842.11.2.30. (det. Gray, 1849 as *Sepia capensis* var.); 1 shell.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I.
a	♀	83	87	43	±18	45	87	11	26
Loc.	Sex	M.L.d.	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♀	83	25	25	28	97	9.5	1.08	0.6

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	W.	Str.z.	Spine	Observations
a	♀	—	±31	±8.5	—	—	
b	—	85	32	7	71	5.9	pl. 17, figs. 99 & 100
c	—	84	30	7	71	7.7	

DESCRIPTION: The body is elongate-oval, the dorsal mantle-margin projects strongly forward extending to beyond the level of the eye-opening, the ventral margin is slightly emarginate. The arms are laterally compressed and keeled on their outer sides; the suckers are quadriserial and the protective membranes are narrow. A very curious deformation is seen on the left dorso-lateral arm, where, at about one third of the length, both protective membranes are completely fused for a distance of about $1\frac{1}{2}$ mm, covering the suckers. The buccal membrane is expanded on the ventral side.

The tentacular club has a strong swimming-membrane, about $1\frac{1}{2}$ times as long as the club. The dorsal protective membrane is nearly as wide as the sucker-bearing surface and is separated at the base from the ventral membrane. The small sub-equal suckers are arranged in about five longitudinal series, their chitinous rings are finely dentate.

The arm-suckers have small, smooth, chitinous rings, each surrounded by a narrow papillate zone, which is surrounded by a thick fleshy zone with radial grooves, which is emarginate at its distal end.

The shell of the holotype is incomplete and the following description is partly based on the other two specimens, especially as regards the posterior portion. It is elongate, rounded at the anterior end and acuminate at the posterior one, which is terminated by a strong spine with a ventral and a lesser developed dorsal keel. The dorsal surface shows a median rib on both sides of which there is a broad flattened zone with a few longitudinal grooves; these zones are separated from the less granulous marginal areas by a more or less angular lateral rib. In the posterior portion a calcareous ridge separates these marginal areas from the dorsal part of the outer cone which is covered by elongate, anastomosing, calcareous tubercles. In the anterior portion the chitinous margins are wider than in the posterior one. The ventral surface is faintly convex and nearly flat in its posterior part, with a very shallow and narrow median groove over the whole length and two wide and shallow marginal grooves. On both sides of the striated zone, the striae of which are very little convex, there is a narrow smooth area which is slightly concave. The inner cone is narrow and its limbs are fused to the outer cone; its posterior part slightly raised as a small sharp ledge, surrounding the posterior depression and is itself surrounded by a ledge formed by the outer cone.

REMARKS: Hoyle (1886, p. 136) mentions that according to Smith *Sepia cultrata* "may be the same species (although a *var.*) that Gray has identified in the museum collection as *Sepia capensis*, but which seems to me distinct from *Sepia capensis* of d'Orbigny (= *Sepia australis* Quoy and Gaimard)".

According to Iredale (1955, pp. 78-79), the original drawing of the type was not correct. "The type bone did not essentially disagree with the variety and both are undoubtedly the local shell which I named *macilenta*, so that *cultrata* can be reinstated, and *macilenta* dropped as a synonym of *Glyptosepia cultrata*."

The specimens we have examined and described agree with Iredale's figures (1926, pl. XXII, figs. 5 & 6) of "*Glyptosepia cultrata*" which he copied from the original figures as he had "been unable to find a specimen in agreement, even after suggesting that both description and figure are incomplete or imperfect" (1926, p. 193).

The original figures of *Glyptosepia macilenta* Iredale (1926, p. 192, pl. XXII, figs. 3 & 4) represent an entirely different species, which cannot be considered to be identical with *Sepia cultrata*.

Iredale (1926, p. 191) created the genus *Glyptosepia* for a group of bones which "differ at sight in their colouration, but the marked feature is the loss of the inner cone, a feature of great significance, while the shape of the bone differs and the spine is very long and strongly keeled".

Moreover "there is no ventral sulcus, though the ventral surface is a little swollen anteriorly and the striated area is generally long".

Notwithstanding these statements, the figures of the different species described by Iredale (1926,

pl. XXII, figs. 1-8) show a ventral sulcus and an inner cone. According to the original descriptions these species possess a ventrally keeled spine, whereas *Sepia cultrata* has a dorsal and a ventral keel on its spine.

Unfortunately we have not had the opportunity to examine Iredale's species of *Glyptosepia*: *G. opipara* (1926, p. 191, pl. XXII, figs. 7 & 8; 1954, p. 72), *G. gemellus* (1926, p. 192, pl. XXII, figs. 1 and 2; 1954, p. 73), and *G. macilenta* (1926, p. 192, pl. XXII, figs. 3 and 4; 1954, p. 73).

Verco & Cotton (1928, p. 127) were the first authors to consider *Sepia hedleyi* Berry, 1918, as a *Glyptosepia*. In the original publication, Berry (1918, p. 261, pl. LXXII, fig. 2) gave a reconstruction of the shell, which was "absent or fragmentary in all specimens seen". This shell resembles that of *Sepia cultrata*, but the tentacular club is different, the minute suckers being arranged in 12 series.

We are not sure that the shell figured by Cotton & Godfrey (1940, p. 437, fig. 424) really belongs to *Sepia hedleyi* Berry.

According to Iredale (1954, p. 74) the species which Cotton (1929, p. 87, pl. XV, figs. 1 & 2) described as *Solitosepia hendryae*, would be best referred to *Glyptosepia*, because it lacks the characteristic inner cone of *Solitosepia* and its anterior end is formed in the style of that of *Glyptosepia*. But in the original description of *Sepia hendryae* the inner cone is described as being "prominent aborally, becoming indistinct orally", whereas according to Iredale (1926, p. 191) "there is no inner cone apparent" in *Glyptosepia*. Moreover, *Sepia hendryae* has a deep median ventral sulcus, which is absent (?) in *Glyptosepia*.

According to Chapman (1912, p. 25):—

"The *Sepia mestus* Gray, which is recorded by Tate and May from the north coast of Tasmania, is a broad form of *S. cultrata* Steenstrup. It might easily be confused with the young stage of *S. apama* Gray, except that the latter has a thicker shell above the median area, and the growth lines are convex and not sinuous, whilst the mucro of *S. cultrata* and its varieties is keeled on the ventral face."

In our opinion, there is not the slightest resemblance between *Sepia mestus* and *S. cultrata* (see p. 47).

Iredale (1926a, p. 238) states that the species recorded by Hedley (1918, p. M.33) as *S. cultrata* is in fact *Solitosepia plangon adhaesa*, Iredale 1926.

28. *Sepia appellöfi* Wülker, 1910
(Pl. 17, figs. 101 & 103; pl. 43, fig. 259)

Sepia appellöfi Wülker, 1910, p. 14, figs. 8, 15-18; Sasaki, 1920, p. 193; 1929, p. 184, pl. XVII, figs. 10-12, text-fig. 106.

Sepia (Doratosepion) appellöfi, Berry, 1912, p. 424; Sasaki, 1914, p. 618.

TYPE LOCALITY: Misaki, Japan.

GEOGRAPHICAL DISTRIBUTION: Japan.

MATERIAL:

a Sagami, Japan (Pres. Ridewood); B.M.1910.9.29.1; 1 ♀.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)									
Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♀	90	82	53	20	27	—	—	42

Loc.	Sex	M.L.d.	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♀	90	42	42	44	145	15	1.1	0.45

SHELL (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
a	♀	90	27	11.5	53	4.5	pl. 17, figs. 101-103

DESCRIPTION: The mantle forms a pronounced mid-dorsal anterior projection. The fins are very narrow and begin about 5 mm behind the mantle-margin. The funnel is very long, its tip reaching the anterior level of the eyes.

All the arms, except the ventral ones, have very slender tips with the suckers arranged in two series. On the ventral arms the suckers are quadriserial along the whole length; on the proximal part of the other arms they are also in four series. According to Sasaki (1929, p. 185) the left ventral arm of the male is hectocotylized in the distal third. The suckers are normal up to the twelfth row while on the remaining distal part they are rudimentary.

The tentacular club is short, oval, covered with minute long-stalked suckers which seem to be arranged in at least eight longitudinal series (pl. 43, fig. 259). These suckers are sub-equal and do not show any larger suckers on the dorsal side. The sucker-less marginal part of the dorsal protective membrane is rather broad.

The shell is elongate, rounded at its anterior margin, and broadest in its anterior third, it is acuminate posteriorly with a strong, straight spine, devoid of keels (pl. 17, figs. 101-103). The dorsal surface shows a distinct median rib and broad chitinous margins; the central part is coarsely granulous, the granules being arranged in longitudinal series in the lateral portions of the posterior half, with a distinct ridge on both sides of the calcareous part. The posterior half of the shell is regularly curved. The ventral surface is concave in the posterior part of the striated area but strongly convex in the anterior third of the shell. The striated area shows a faint, narrow, median groove; the striae are regularly convex in the posterior part and are more wavy in the anterior portion where they are convex on both sides of the median groove. The inner cone forms a regularly-rounded ridge, its posterior part surrounding the posterior excavation; its lateral limbs are situated at the margins of the striated area which is separated from the outer cone by two distinct, smooth zones. The outer cone is narrow, chitinous in its lateral parts and calcareous in its slightly expanded posterior part, which forms two wings surrounding the inner cone.

REMARKS: This species differs from *S. kobiensis* in its tentacular club and its broader shell, the inner cone of which does not possess the elongate posterior ledge.

The shell of *S. appellöfi* resembles that of *S. murrayi* (p. 64) in its general shape, but it is relatively broader, with broader chitinous margins on the dorsal surface and a coarser sculpture. The tentacular club of the latter has only five series of minute, sub-equal suckers and a broader dorsal protective membrane. The hectocotylus of *S. murrayi* is unknown.

29. *Sepia sewelli* sp. nov.

(Pl. 17, figs. 104-106; pl. 46, fig. 273)

MATERIAL:

Holotype:

- a. John Murray Exp. Sta. 27, 11°57'12"N., 50°35'00" E. to 11°56'42"N., 50°39'12"E., near Cape Guardafui, 37 m, 12.x.1933; 1 ♀. B.M. 196378W.

Paratypes:

- b. John Murray Exp. Sta. 105, 5°34'24"S., 39°14'06"E. to 5°37'00"S., 39°14'36"E., Zanzibar area, 238 m, 11.i.1934; 1 ♀ (in poor condition), B.M. 196379W.
- c. John Murray Exp. Sta. 106, 5°38'54"S., 39°15'42"E. to 5°40'18"S., 39°17'36"E., Zanzibar area, 212 m, 12.i.1934: 17 young specimens (in poor condition). B.M. 196380W.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)									
Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a.	♀	24	98	56	33	52	—	8	35

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♀	24	35	35	35	—	14.5	—	—

SHELL (IN % OF SHELL-LENGTH)							
Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
c	—	31	26	9.7	54	7.4	pl. 17, figs. 104-106

DESCRIPTION: The dorsal mantle-margin projects forward slightly and the ventral one is emarginate. The fins are widely separated posteriorly. The web is low, being highest between the dorso-lateral and ventro-lateral arms and between the ventro-lateral and ventral ones.

The suckers are quadriserial, the median ones being slightly bigger than the lateral ones.

The swimming-membrane of the tentacular club is slightly longer than the club. The dorsal protective membrane is rather broad. The minute, sub-equal suckers are arranged in about six to eight longitudinal series (pl. 46, fig. 273).

The shell is elongate with a well developed median rib flanked by two shallow grooves on the dorsal surface. The granulous calcareous part is limited by two narrow calcareous ridges (pl. 17, figs. 104-106).

The ventral surface is slightly raised with a narrow, shallow groove over its whole length. The striated area has convex striae which are slightly emarginate in the middle; it is flanked by two smoother, slightly concave marginal zones. The narrow limbs of the inner cone are situated between the striated area and the marginal zones. its posterior part forms a slightly larger, rounded posterior ledge.

The wings of the outer cone constitute a cup-like formation.

The spine is straight, directed upwards; its dorsal margin is convex and it is devoid of keels.

REMARKS: This species differs from *Sepia kobiensis* (p. 71) in the different arrangement of the tentacular suckers, the flatter shell, the absence of the longitudinal striae on its dorsal calcareous surface and in the less developed posterior portion of the inner cone.

Compared with *S. murrayi*, the tentacular club of *S. sewelli* has a greater number of longitudinal series of suckers. The shell of *S. sewelli* is slightly wider and thicker in its anterior part. The dorsal surface has its granulous covering limited by a distinct marginal ridge, whereas in *S. murrayi* the granules constitute several marginal lines. In *S. sewelli* the ventral median groove is wider, the outline of the striae distinctly different, being reversed V-shaped in the anterior part of the striated area. It

will be noted that this outline is reversed W-shaped in *S. murrayi*. The posterior part of the inner cone forms a rounded ledge in *S. sewelli* and a more angular sharp ledge with radiating calcareous keels in *S. murrayi*.

In *Sepia appellöfi* the shell has about the same general outline as that of *S. sewelli*, but the shell of the former species is thicker, its dorsal surface more coarsely granular, the granules mostly arranged in longitudinal series on the posterior part (limited also by a marginal calcareous ridge) and the chitinous margins are much wider; the outline of the striae in the anterior part of the striated area is also different, being reversed W-shaped as in *S. murrayi*. The arrangement of the tentacular suckers of *S. appellöfi* is approximately the same as in *S. sewelli*; unfortunately the hectocotylus of the latter is unknown.

30. *Sepia murrayi* sp. nov.
(Pl. 18, figs. 107–111; pl. 43, fig. 260)

Holotype: John Murray Exp. Sta. 71, 25°35'00"N., 56°42'18"E. to 25°43'00"N., 56°39'18"E., Gulf of Oman, 106 m, 26.xi.1933; 1 ♀ (M.L.d. = 40 mm). B.M. 196381W.

Paratypes: Idem; 2 ♀. B.M. 196382–3W.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
	♀	40	85	40	20	39	80	10	30
	♀	40	85	39	20	40	83	12.5	30
	♀	41	90	41	22	39	90	10	32

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
	♀	40	32	32	32	112	10	1.0	0.6
	♀	40	30	30	32	95	10	1.0	0.6
	♀	41	32	32	34	110	10	1.0	0.6

SHELL (IN % OF SHELL-LENGTH)

Loc.	Sex	L.in mm	W.	Th.	Str.z.	Spine	Observations
	♀	40	22.5	7.5	55	6.2	Holotype, pl. 18, figs. 107–109

DESCRIPTION: The body is elongate-oval, acuminate behind and with an angular but not very long dorsal mantle-margin, reaching the mid-level of the eyes; the ventral margin distinctly emarginate around the funnel. The head is as wide as the mantle. The fins begin at a short distance behind the mantle-margin; they are rather broad in well preserved specimens, their posterior borders extending beyond the end of the mantle, coming very close together without fusing and leaving a small notch at the base of the spine (pl. 18, figs. 110 & 111).

All the arms are laterally compressed with distinct, but low, swimming-membranes, even on the dorsal ones; this membrane is more developed on the ventral arms.

The distal ends of the arms are not effilated but are bluntly pointed; at these tips the protective membranes are wider and folded over the inner arm surface, more or less covering the suckers. On

the dorsal arms all the suckers are biserial. On the dorso-lateral arms there may be some doubt as to the interpretation of the arrangement of the suckers but they also seem to be biserial. Near the tip these suckers are minute and distinctly biserial, leaving a wide space between them; this arrangement is faintly visible on the right dorsal arm. The same arrangement is seen in all the other arms. These biserial suckers are best seen in one of the paratypes ($L_M = 40$ mm) but in the other specimens most of the arms show alternate pairs of suckers which may be interpreted as oblique rows of four, but on all the arm-tips the arrangement is distinctly biserial. The chitinous rings of the arm-suckers are smooth.

The tentacles are long and slender, the stem being triangular in cross-section. The short and narrow club is crescent-shaped with a strong swimming-membrane on the dorsal side, extending slightly beyond the base of the club (pl. 43, fig. 260). The dorsal protective membrane is very broad being nearly as wide as the sucker-bearing surface. Both protective membranes remain widely separated at the base of the club and extend down the stem as faint ridges. The minute, sub-equal suckers are arranged in five longitudinal series; their chitinous rings are finely dentate. The web is sub-equal and very low in all sectors.

The shell is very slender and is widest in its anterior third; its posterior part is strongly curved (pl. 18, figs. 107–109). The dorsal surface shows a distinct median rib, flanked by two shallow grooves. In the anterior half the chitinous margins are wide. The whole calcareous part is coarsely granular, these granules forming longitudinal lines at the margins of the posterior part. The ventral surface is rather flat, with a deep narrow median groove over its whole length. On both sides of this groove the surface is regularly convex, except in the posterior part of the striated area, which is flatter. In the anterior portion of the striated area the striae have a reversed W-shape. On both sides of the striated area there is a narrow smooth zone. The limbs of the inner cone are situated on the margins of the striated area and descend slightly on the smooth zones at about half the length of the striated area. At the posterior end these limbs form a V-shaped, straight, sharp ledge which surrounds the posterior excavation. From this ledge radiate narrow sharp keels towards the calcareous posterior shallow cup formed by the small expansion of the outer cone. The straight spine is directed upwards and is devoid of any keels.

REMARKS AND RELATIONSHIP: Unfortunately the material we had at our disposal consists only of female specimens, so that we cannot describe the hectocotylus.

After having discussed (p. 74) several of the species possessing a slender curved shell with a distinct spine, we arrive at the conclusion that it is in some cases nearly impossible to identify or distinguish these species without knowing the animals, both male and female.

The peculiar arrangement of the suckers on the arm-tips of this new species does not seem to exist in any other species, except in *S. trygonina* (p. 85). The tentacular club resembles that of *S. kobiensis* in the broad dorsal protective membrane, but it lacks the larger suckers of the second row.

The shell shows several differences: the dorsal sculpture with the longitudinal lines of tubercles being much more pronounced in the latter species. The outline of the striae is distinctly different due to the deeper median groove in *S. murrayi*. The inner cone does not show the long ventral ledge seen in *S. kobiensis* and this species lacks the radiating keels between the inner and the outer cone. The shell of *S. murrayi* more nearly resembles that of *S. burnupi* (p. 82) and of *S. trygonina* (p. 85), but the relative importance of the striated area and the two marginal zones is definitely different, the limbs of the inner cone being much more divergent in *S. murrayi* and with sharper edges of the raised posterior part. The inner cone is exactly of the same structure and general form as in *S. omani* (p. 94); in *S. murrayi* the posterior ledge is only slightly more raised and sharp-edged, but *S. omani* has a keeled spine and a completely different animal.

On p. 61 we pointed out the differences between *S. murrayi* and *S. appellöfi*.

The shell of *S. murrayi* resembles that of *S. tokioensis* Ortmann, 1888 (p. 653, pl. XXIII, fig. 3) and of *S. misakiensis* Wülker, 1910 (p. 15, figs. 5, 6, 19-22) but it is flatter and the animal is quite different from these.

As we mention on p. 73, the shell from Poeloe Weh which Adam (1939c, p. 38, pl. I, fig. 6) identified as *S. andreanoides*, probably belongs to *S. murrayi*.

Two shells from Santubong and Buntal, Sarawak (Coll. E. Bartlebat) B.M. 1894.7.14.11-12), may belong to *S. murrayi*.

31. *Sepia confusa* Smith, 1916
(Pl. 18, figs. 112 & 113; pl. 42, fig. 248)

Sepia burnupi Hoyle, 1904 (pars), p. 27, pl. I, fig. 192.

Sepia confusa Smith, 1916, p. 24, pl. II, figs. 7 & 8; Tomlin, 1923, p. 41; Robson, 1924, p. 12; Turton, 1932, p. 1.

Dorotosepion confusa, Massy & Robson, 1923, p. 435, figs. 1-3.

Dorotosepion confusum, Robson, 1924a, p. 647.

Sepia (Dorotosepion) confusa, Massy, 1925, p. 221, pl. XIII, figs. 20, 21, 24-28, pl. XIV, fig. 38; 1928, p. 93.

TYPE LOCALITIES: Tongaat Beach, Natal; Port Elizabeth, Cape Colony.

GEOGRAPHICAL DISTRIBUTION: South Africa.

MATERIAL:

- a. Tongaat Beach, Natal (Burnup); B.M. 1920.3.23.1; 1 shell (holotype, figured by Smith, 1916, pl. II, figs. 7 & 8).
- b. Port Elizabeth, Cape Colony (Spencer); B.M. 1890.12.14.42; 1 shell (fragment of 80 mm).
- c. Natal Coast (Gilchrist, Sta. 95), 192 fms.; B.M. 1924.9.9.43-44; 2 ♂ and fragments of their shells (Robson, 1924, p. 647).
- d. Natal Coast (Gilchrist, Sta. 102), 158 fms.; B.M. 1924.9.9.46-47; 2 ♀ and fragments of their shells (Robson, 1924, p. 647).
- e. Natal Coast (Gilchrist, Sta. 107), 180 fms.; B.M. 1924.9.9.48; 1 ♂ (Robson, 1924, p. 647).
- f. Natal Coast (Gilchrist, Sta. 167), 36 fms.; B.M. 1924.9.9.45; 1 ♀ and fragment of shell (Robson, 1924, p. 647).
- g. John Murray Exp. Sta. 106, 5°38'54"S., 39°15'42"E. to 5°40'18"S., 39°17'36"E., Zanzibar area, 212 m, 12.i.1934; 1 ♀. B.M. 196384W.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
c	♂	±105	71	36	24	27	—	12.5	35
e	♂	±100	70	35	25	28	—	13	35
c	♂	90	72	38	22	32	—	14.5	33
d	♀	85	79	33	23	33	79	13	33
g	♀	84	81	33	18	33	80	8.5	30
f	♀	80	75	35	19	30	81	12.5	34
d	♀	77	80	36	22	31	87	13	38

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>c</i>	♂	±105	29	29	31	85	13	1.5	1.4
<i>e</i>	♂	±100	30	28	30	90	14	1.2	1.8
<i>c</i>	♂	90	28	28	28	—	—	1.7	—
<i>d</i>	♀	85	32	32	33	82	14	1.8	1.2
<i>g</i>	♀	84	32	32	34	—	—	1.5	—
<i>f</i>	♀	80	35	32	35	—	—	1.9	—
<i>d</i>	♀	77	34	34	36	—	13.5	1.7	1.2

SHELL (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
<i>g</i>	♀	84	19	9	±62	4.8	pl. 18, figs. 112 & 113

DESCRIPTION: The body is elongate with rather broad fins; the dorsal mantle-margin is very long and acuminate, reaching the mid-level of the eyes and the ventral margin is slightly emarginate. The dorsal mantle surface shows two blunt ribs or ridges beginning at the anterior end of the fins and converging obliquely to about 2.5 cm from the posterior end of the mantle.

The males show the peculiar tail-like formation of the fins described by Massy & Robson (1923, p. 435). At the posterior end the fins are fused in a single band-like broad tail the length of which may even exceed the length of the mantle. The true function of this secondary sexual character is unknown.

All the arms are laterally compressed and keeled on their outer sides, the ventro-lateral and ventral ones possessing distinct swimming-membranes. In the male, the globular arm-suckers are quadriserial, the median ones being twice as wide as the lateral ones on the basal two-thirds of each arm; they become gradually sub-equal at the distal ends. The left ventral arm of the male does not show any transformation, but the protective membranes, especially the dorsal one, are slightly wider in the distal third of the arm. The chitinous rings of the arm-suckers are smooth. In the female the suckers of the distal ends of the arms become minute and biserial with a wide space between them; at the extreme tip the protective membranes are folded inwards and cover the sucker-bearing surface.

The tentacular club has a well-developed swimming-membrane, which extends slightly beyond the base of the club (pl. 42, fig. 248). The protective membranes are narrow and separated at the base of the club. The suckers seem to be arranged in five or six series, but in fact they constitute very oblique transverse series of eight. About six suckers from the third longitudinal series, situated in the middle of the sucker-bearing surface, are much bigger than the other ones.

The chitinous rings of the tentacular suckers are finely dentate.

The type shell has its dorsal surface rounded with a median rib and two grooves. In the anterior portion only the rib is calcified; in the posterior part the calcified area is broader with distinct longitudinal ridges but anteriorly these ridges are restricted to the median rib as fine fillets of tubercles. The calcareous portion is orange-coloured. The ventral surface is convex with a narrow median groove along its whole length; the striae are convex on both sides of this groove. There is a very narrow smooth zone on both sides between the striated area and the outer cone. The limbs of the inner cone are situated at the margins of the striated area; they disappear near the middle of the latter.

The shell of the female specimen from the John Murray Expedition is the only complete one we have seen (pl. 18, figs. 112 & 113). It is acuminate at both ends. The dorsal surface is rounded with a narrow median rib flanked by two deep grooves. In its anterior portion only the rib is calcified and granulous while in the posterior part a small area next to the rib is calcified; the latter shows some longitudinal calcified ridges, especially in its posterior part. The ventral surface is convex

anteriorly and flattened near the posterior end. There is a narrow, shallow, median groove over the whole length. In its anterior portion the striae are reversed W-shaped, and concave in the middle. The striated area is limited by the narrow limbs of the inner cone, without any smooth marginal zones. In the posterior part the inner cone forms a rather high, sharp-edged ledge, the extreme portion of which is somewhat wider, thicker and rounded, surrounding the posterior excavation; from this semi-circular ledge many fine keels radiate on the calcareous semi-circular expansion of the outer cone. The spine is constricted at the base, widest in the middle, slightly directed upwards and without any keels.

REMARKS: As we state on p. 82, Smith (1916, p. 24) was perfectly right to separate this species from *S. burnupi*.

According to Robson (1924a, p. 648) it "shows marked affinities, as far as concerns the only common structure known (the shell), with *D. burnupi* and *insignis*".

In our opinion there is hardly a single character in which *S. confusa* and *S. insignis* are related, the latter species cannot even be placed in *Doratosepion* if one wishes to accept this genus or sub-genus (see p. 114, pl. 31, figs. 189-191).

The shell of *S. confusa* seems to be very much like that of *S. pardalis* Sasaki, 1914 (p. 614, pl. XII, figs. 1-3), but the animal, especially the male, is quite different.

This latter, Japanese, species was based on two male specimens of about 230 mm mantle-length. The dorsal mantle-margin is long and tongue-shaped. The arms are relatively short, the dorsal ones being longest and more or less whip-like. The suckers are quadriserial at the base of the arms, biserial on the distal half of the dorsal arms and on the distal third of the lateral ones. On the proximal two-thirds of the left ventral arm there are about 17 transverse rows of normal suckers, whereas the distal third bears only rudimentary suckers. The minute sub-equal tentacular suckers are arranged in eight series.

The shell is slender, lanceolate, more than five times as long as broad, broadest in front of the middle and terminates in a small discoidal outer cone. Its dorsal surface is strongly convex, with a distinct median ridge, marked off by two deep grooves. The surface is coarsely granulous, the granules being arranged in longitudinal lines, slightly diverging from the posterior end. The ventral surface is slightly concave in its posterior part and markedly convex in the anterior, with an irregularly excavated median groove, with the "striated area marked with numerous longitudinal streaks, its anterior border indented in two places". The rim of the inner cone is comparatively broad, but flattened into an only slightly elevated V-shaped ridge at the posterior end. The spine was broken.

32. *Sepia incerta* Smith, 1916 (Pl. 19, figs. 114 & 115; pl. 41, fig. 241)

Sepia burnupi Hoyle, 1904 (pars), p. 27, pl. I, figs. 190 & 191.

Sepia incerta Smith, 1916, p. 23, pl. II, fig. 6; ? Tomlin, 1923, p. 41; ? Turton, 1932, p. 1.

Sepia (Doratosepion) burnupi, Massy, 1925, p. 215, pl. XII; 1928, p. 94; Barnard, 1962, p. 252, fig. 4.

TYPE LOCALITIES: Tongaat Beach, Natal; Port Elizabeth, Cape Province.

GEOGRAPHICAL DISTRIBUTION: South Africa.

MATERIAL:

- a. Port Elizabeth (Spencer); B.M. 1890.12.14.43-44; 2 fragments of shells (syntypes).
- b. Isipingo (Falcon); B.M. 1952.12.30.71; 1 fragment of shell.
- c. Durban; B.M. 1952.12.30.75-76; 2 fragments of shells.
- d. Durban (Pres. Chubb); B.M. 196385W; 2 ♂.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
<i>d</i>	♂	135	67	37	27	24	—	11	81
	♂	140	74	34	21	25	—	11	84
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>d</i>	♂	135	37	38	59	96	15	1.5	3.1
	♂	140	39	39	63	86	14	1.6	2.9

DESCRIPTION: Both male animals have a long conical body with broad fins beginning nearly at the mantle-margin and extending beyond the posterior end of the body; their bases fused on the dorsal surface at about 7 mm from the end of the mantle. The dorsal mantle-margin projects forward strongly and the ventral margin is largely emarginate.

The dorsal surface shows a series of slightly elevated, round, dark spots, situated about in the middle of each fin. Parallel to these there is a series of elongate tubercles at the base of each fin. The rest of the dorsal surface shows numerous small tubercles and at a distance of about 2 cm from the margin of the fins there is a rounded ridge which extends from the mantle-margin to about 2.5 cm from the end of the body.

The dorsal arms are slightly angular on their outer sides. The basal portion shows the following structure over a length of about 25 mm: at the base there are four groups of four suckers placed in alternate pairs, the marginal suckers being smaller than the median ones; beyond these the protective membranes are wider with about seven, spaced, transverse ridges which alternate, each ridge uniting the inner margin of a membrane to the outer margin of the opposite membrane. In the middle of the arm these ridges are separated by deep depressions. Each ridge bears two small suckers, an inner one at the base of one protective membrane and its smaller partner on the outer margin of the opposite membrane. Beyond this basal portion the arms are devoid of suckers. The protective membranes, especially the ventral ones become very wide and thin, attaining a width of nearly 20 mm at the beginning of the distal third of the arm length. These membranes consist of thick, narrow, fleshy ribs separated by very thin membranous parts which are partly torn. In their widest part the two membranes are fused on about one third of the width of the ventral membrane. At the effiliated tips the ribs and membranes disappear.

The dorso-lateral arms are keeled on their ventral outer margins: their suckers are quadriserial throughout the whole length of the arms, the inner suckers being larger than the outer ones.

The ventro-lateral arms have distinct ventral swimming-membranes and the same arrangement of the suckers.

On both ventral arms, which possess strong swimming-membranes, the suckers are normally arranged on the basal halves. Beyond these, the dorsal protective membrane is wider, the suckers much smaller, more and more biserial on the right arm and close together in the median part of it, finally they disappear completely. On the left ventral arm the suckers remain quadriserial almost to the tip, the outer suckers being very minute; there is one series on the middle of each protective membrane, situated on thick fleshy transverse ridges.

The tentacular club (pl. 41, fig. 241) is very much like that of *S. prashadi* (pl. 41, figs. 245 and 246). The swimming-membrane is slightly longer than the club, the dorsal protective membrane being nearly completely separated from the club by a deep groove. Both protective membranes come very

close together at the base of the club but remain separated and continue down the stem as rounded ridges. The suckers are arranged in very oblique transverse series of eight. The first, dorsal sucker is small, the second is one and a half times as big, the third is more than twice as wide as the second and the fourth is intermediate in size between the first and the second, the four last ones being about the size of the first. This arrangement is seen in the first four or five transverse rows, particularly in the second to the fourth. The distal part of the club bears only small suckers. The smaller suckers have finely dentate chitinous rings.

In the large specimen both ventral arms are exactly of the same type as the left one described above for the smaller male. The dorsal arms of this specimen have the same transformation as the one described above, but it begins nearer the base, and the holes are absent, these probably being artefacts due to the thin membranes being torn.

Unfortunately the shells of both specimens are very broken and cannot be extracted for description.

The type shells are very long and slender, but incomplete (pl. 19, figs. 114 & 115). Their dorsal surface shows three calcareous ribs, separated by two narrow grooves that are particularly developed in the posterior half, where the ribs have about the same width. Near the anterior end the lateral ribs diminish gradually in width and finally disappear. The ribs are coarsely granular and salmon-coloured in colour. The chitinous margins are broad. The ventral surface is not very high; it is convex in its greater part and has a shallow and narrow median groove which is somewhat wider on the last loculus. The striated area is convex, the outline of the striae being reversed V-shaped—quite distinct from that in *S. confusa*. The striated area is flanked by two nearly smooth marginal zones. The narrow limbs of the inner cone are situated at the margins of the striated area or descend on the smooth zones. The posterior part of the shell is lacking.

REMARKS: Up to the present only the male of this species is known. The female specimens described by Massy (1925, p. 219) belong in fact to *S. burnupi* as we explained on p. 82.

Barnard (1962, p. 252) mentions six specimens from the East London area (33°4'S., 27°54'E., 27 fms.) as belonging to "*Sepia burnupi*". Four of these were males which belong without any doubt to *Sepia incerta*. The author does not state if the other specimens were females and he does not describe them, which is a pity because the female of *S. incerta* has never been described. The arms seem to be longer in Barnard's specimens: in the largest male, of 143 mm mantle-length the dorsal arms are two and a half times, and the ventral arms nearly twice as long as the lateral ones. The description of the modified dorsal arms agrees with our material. As to the ventral arms, the author states that no modification could be recognized as a hectocotylus: "The suckers decrease regularly and gradually in size throughout the whole length of the arm, and on the distal quarter are gradually reduced to 3 in a row, then to 2 and finally to a single row extending to the tip."

Sepia incerta seems to be very closely related to *S. lorigera* Wülker, 1910, of which Sasaki (1929, p. 189) has described both males and females. The dorsal arms of the male of the latter species are much longer, attaining about twice the length of the mantle. Their tips are "markedly thickened, bordered by broad, trabeculate, protective membranes" (Sasaki, 1929, p. 191). The shell is also very similar but seems to be comparatively broader in *S. lorigera*, with a different outline of the striae. As we have only examined incomplete shells of *S. incerta* and as we have not seen any specimens of *S. lorigera*, we do not wish to make any final statement, but we would not be surprised if the differences between these two species turned out to be only of a sub-specific importance, perhaps even due only, as regards the relative lengths of the arms, to the state of preservation.

Sasaki (1914, p. 619; 1929, p. 188, pl. XVII, fig. 13) has described a related species, *S. longipes*, which differs (p. 189) from *S. lorigera* "in the broader body, in the longer arms, in the carinated shell, and in that the hectocotylization affects both the arms of the ventral pair".¹ In *S. lorigera*

¹ On p. 188 the author states that both dorsal arms are affected by hectocotylization, but it is clear that he means the ventral arms.

the distal third of the left ventral arm is hectocotylized, "bearing minute rudimentary suckers, the peduncular bases of which are characteristically swollen into transverse ridges"; in *S. longipes* the distal two-fifths of the left ventral arm "is furrowed longitudinally and has rudimentary suckers in four series. On the proximal three-fifths are found twelve transverse rows of normal suckers".

The right ventral arm is less transformed "and the rudimentary suckers, which are less reduced in size than those of the left arm, are confined beyond the fourteenth row".

In both these Japanese species the tentacular suckers are apparently in longitudinal series of four, but are in fact arranged in oblique transverse series of eight, the four in the middle being much larger.

33. *Sepia joubini* Massy, 1927
(Pl. 43, fig. 257)

Sepia (Doratossepion) joubini Massy, 1927, p. 161, pl. XVIII.

TYPE LOCALITIES: Tugela River mouth, Cape Natal.

GEOGRAPHICAL DISTRIBUTION: South Africa.

MATERIAL:

- a. Tugela River mouth, N.W. by N. $\frac{3}{4}$ N.15 $\frac{1}{2}$ miles (P.F.11,741, No. 1252), 36-42 fms., m.; B.M. 1926.10.20.38; 1 ♀ (syntype).
b. Cape Natal, W. by N.6 $\frac{1}{2}$ miles (P.F.10,715, No. 1262), 54 fms., fine sand and algae; B.M. 1926.10.20.39-40; 1 ♂, 1 ♀ (syntypes).

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♀	47	83	32	25	30	85	8.5	30
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♀	47	38	38	—	72	9.5	1.05	1.3

DESCRIPTION: The female specimen from Tugela River mouth is elongate, cylindrical in its greater part and bluntly rounded posteriorly. The dorsal mantle-margin projects forward in a sharp angle, beyond the mid-level of the eyes; the ventral margin is emarginate in the middle. The rather broad fins begin shortly behind the mantle-margin and extend beyond the posterior end of the mantle, coming very close together on the dorsal surface without being fused. There is a series of three or four widely-spaced, elongate, tubercles on the dorsal base of the fins and just median to them there is a narrow fleshy ridge, beginning at the anterior end of the fins and converging towards the posterior end of the body where they come close together at about 5 mm from the end.

The suckers of all the arms are very obliquely quadriserial, the median ones being wider than the marginal ones. Here and there they seem to be biserial, which is not the case. At the tip of the dorsal arms they remain quadriserial, with a space in the middle, covered by the wide protective membranes. The lateral arms are very narrow and whip-like in their distal half¹ with minute biserial suckers,

¹ According to Barnard (*in litt.*) the whip-like tips of the lateral arms in the ♀ begin to develop from about 30 mm mantle-length. The whip becomes longer relative to the proximal portion, and may become a little longer than the latter.

separated by a smooth and hollowed out empty space; the protective membranes are very narrow. The ventral arms are incomplete. Those of the female specimen from Cape Natal are normal with quadriserial suckers. The ventral and dorsal arms are sub-equal in length, the lateral ones slightly longer.

The male specimen from Cape Natal has sub-equal arms without the whip-like transformation of the lateral ones, their suckers are quadriserial throughout their whole length. According to the original description, the fourth right arm has large irregular proximal suckers, succeeded by four in a row of much smaller size; distally the suckers become very minute, but appear to be in four rows to the tip of the arm. The hectocotylus on the fourth left arm is rather obscure. It is situated on the distal half of the arm where the suckers on the dorsal border become more minute and are separated considerably from the ventral suckers which are reduced to a single row. This arrangement persists for about six rows. The distal portion has minute suckers placed four in a row.

The tentacles are slender with short clubs (pl. 43, fig. 257). The swimming-membrane extends beyond the base of the club on the tentacular stem. The protective membranes are narrow and separated at the base. The suckers are arranged in about five longitudinal series, but in fact they form very oblique transverse series of eight. In the middle of the club four or five suckers of the third longitudinal series are much wider than the other ones. The tentacular suckers have finely dentate chitinous rings; those of the arm-suckers are slightly notched or smooth.

According to the original description, the shell is of the *Doratosepion* type with a spine, but we do not have any further details.

REMARKS: The shell being practically unknown, we must wait for more material before being able to compare this species with other ones.

34. *Sepia kobeensis* Hoyle, 1885

(Pl. 19, figs. 116-120; pl. 43, fig. 255; pl. 44, fig. 264)

Sepia andreanoides Hoyle, 1885, p. 193; 1885a, p. 297; 1886, p. 139, pl. XXI, figs. 11-19, pl. XXII, fig. 11; Pilsbry, 1895, p. 3; Joubin, 1897, p. 102; ? Adam, 1939c, p. 38, pl. I, fig. 6.

Sepia (Doratosepion) andreanoides, Berry, 1912, p. 423; ? Massy, 1916, p. 229; Ishikawa, 1924, p. 194.

Sepia kobeensis Hoyle, 1885, p. 195; 1885a, p. 300; 1886, p. 142, pl. XVIII, figs. 7-14; ? 1905, p. 982; Appellöf, 1886, p. 20, pl. 3, fig. 7; Ortmann, 1888, pp. 654, 665; Wülker, 1910, p. 16; Sasaki, 1920, p. 194; Adam, 1939c, p. 39.

Sepia (Doratosepion) kobeensis, Berry, 1912, p. 423; Sasaki, 1914, p. 617; ? Massy, 1916, p. 230; Sasaki, 1929, p. 203.

Sepia kobeensis var. *typica* Sasaki, 1929, p. 204, fig. 111, pl. XIX, figs. 1-4.

Sepia kobeensis var. *andreanoides*, Sasaki, 1929, p. 206, figs. 112-114, pl. I; fig. 7, pl. XIX, figs. 5-7.

Sepia kobeensis var. *sagamiana* Sasaki, 1929, figs. 112-114.

Sepia kobeensis var. *toyamensis* Sasaki, 1929, p. 209, fig. 115, pl. XIX, figs. 8-12.

Sepia kobeensis var. *beppuana* Sasaki, 1929, p. 211, fig. 116, pl. XIX, figs. 13-15.

Sepia kobeensis var. *crassa* Sasaki, 1929, p. 213, pl. XIX, figs. 16-18.

Sepia kobeensis var. *albatrossi* Sasaki, 1920, p. 195, pl. XXVI, figs. 2 & 3; 1929, p. 214, fig. 117, pl. XIX, figs. 19-26.

TYPE LOCALITIES: Yokohama market (*S. andreanoides*); Bay of Kobe (*S. kobeensis*); Toyama Bay (var. *toyamensis*); Beppu Bungo Province (var. *beppuana*); Enoura, Suruga Province (var. *crassa*); Okinoshima, Krusenstern Strait (var. *albatrossi*).

GEOGRAPHICAL DISTRIBUTION: Japan; ? Laccadive Sea, 11°14'30"N., 74°57'15"E., 68-148 fms.; 13°36'N., 47°32'E., 130 fms.; ? S. of Ceylon, 6°2'30"N., 81°29'E., 52-68 fms.; ? Kolumadulu Atoll, 35 fms.; ? Persian Gulf, 26°20'N., 53°54'E., 53 fms.; ? off C. Negrais, Burma, 16°0'N., 93°37'E., 40 fms.; ? Poeloe Weh.

MATERIAL:

a. Yokohama market; B.M. 1889.4.24.78-79; 1 ♂, 1 ♀ (syntypes of *S. andreanoides* Hoyle).

b. Challenger Sta. 233; 34°39'N., 135°14'E., Bay of Kobe, Japan, 8 fms., 17.v.1875; B.M. 1889.4.24.81; 1 ♀ (holotype of *S. kobeensis*).

MEASUREMENTS:

ANIMALS OF *S. andreanoides* (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♂	60	85	43	21	33	—	—	42
	♀	60	83	45	24	35	—	—	43
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♂	60	32	30	33	133	10	1.65	0.4
	♀	60	37	38	38	—	—	1.35	—

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Observations.
a	? ♀	60	22	9	66	<i>S. andreanoides</i> pl. 19, figs. 118-120
b	♀	40.5 ⁺	±17.5	±9.4	±62	<i>S. kobeensis</i> , pl. 19, 116 & 117

DESCRIPTION: *Sepia andreanoides*. In the collection of the British Museum we found only two of the three specimens mentioned by Hoyle but not the shell figured by the author (pl. XXI, figs. 14-16) which is longer, if the indication "natural size" is correct. As the two animals we examined show the same length, we are not sure if the shell we figure (pl. 19, figs. 118-120), and which had already been extracted, belongs to the male or the female. But as a fragment of a second shell is in the jar with the animals, the width of which is only 12 mm, we presume that the figured shell belongs to the female.

The quadriserial arm-suckers in both sexes are globular, the median ones being larger than the marginal ones.

The tentacular club is narrow; the swimming-membrane extends beyond the base of the sucker-bearing surface and the dorsal protective membrane is rather wide (pl. 44, fig. 264). The suckers are apparently arranged in four or five series, but form in fact oblique transverse rows of eight; the suckers of the third longitudinal series are larger than the other ones, contrary to the indication in the original figure (pl. XXI, fig. 13) which shows them as sub-equal.

The hectocotylus is very characteristic and differs slightly from the original figure (pl. XXII, fig. 11) which seems to show a median keel in the transformed distal part. In fact, this is a shallow groove and it is described correctly in the text (p. 139). But Hoyle did not mention the fact that the extreme distal part again bears four rows of normal, minute suckers, mostly hidden by the protective membranes. There are about 12 rows of normal suckers on the proximal half.

The shell is elongate, widest in the first third of its length, obtusely acuminate at the anterior end and regularly tapering towards the posterior end, with the exception of the outer cone which forms a shallow, cup-like widening (pl. 19, figs. 118-120).

The dorsal surface is calcified, with a faint median rib; the fine granulation is partly arranged in longitudinal lines and limited by two narrow, calcareous, marginal ridges. The ventral surface shows

a narrow, shallow, median groove in the striated area and a broader depression in the anterior part of the last loculus. The striae are convex with a faint incurvation in the middle.

The inner cone has a well-developed, elongated, posterior portion and very narrow lateral limbs that disappear anteriorly nearly half-way along the striated area. The latter is separated from the outer cone by two smooth, very narrow, marginal zones.

The outer cone is very narrow, except at its posterior end, where it forms a cup-like widening, surrounding the inner cone.

The strong spine is broken, but is distinctly directed towards the dorsal side.

Sepia kobeensis. This specimen agrees with the original description. The arms seem very much contracted and do not show the elongate tips which characterize *S. andreanoides*.

The tentacular club (pl. 43, fig. 255) is better preserved than in *S. andreanoides*. It has a broad swimming-membrane which extends beyond the base of the club. The dorsal protective membrane is broad, attaining about half the width of the sucker-bearing surface. The suckers are apparently in four or five series, but actually form oblique transverse rows of eight, five suckers from the third longitudinal series being much larger than the other ones. This difference in size is more pronounced than in *S. andreanoides*, but this may be partly due to better preservation.

The shell shows some small differences compared with that of *S. andreanoides*. It is narrower, the longitudinal striation of the dorsal calcareous covering is less distinct and the posterior portion of the inner cone shorter (pl. 19, figs. 116 & 117).

REMARKS: We agree with Sasaki (1929, p. 203) that *S. andreanoides* and *S. kobeensis* cannot be separated specifically, and although *S. andreanoides* has page-priority, we have to follow Sasaki (1929, p. 206) who described *S. andreanoides* as a variety of *S. kobeensis*.

This seems to be a common Japanese species, but we are not sure that the references from other regions are correct.

Massy (1916, pp. 229 and 230) reported both species from the same stations in the Laccadive Sea and S. of Ceylon and also *S. andreanoides* from 13°36'N., 47°32'E., as well as *S. kobeensis* from the Persian Gulf and from off C. Negrais, Burma. Most of the specimens she examined were very small, 20–21 mm in dorsal mantle-length, and only the male *S. andreanoides* from the Laccadive Sea reached 48 mm in dorsal mantle-length.

She states that the hectocotylus and the shell of this animal agree with the description of the type, but "about twelve of the club suckers are as large as those of the arms". As to *S. kobeensis* (p. 231), she states that "The outline of the striated area of the shell seems a little different in these specimens to the description of the type and to the illustration of Appelöf (1886, pl. 3, fig. 7a). The present examples have no median indentation in the curved line which more resembles that of the shell of *S. esculenta* Hoyle. The line is, however, somewhat irregular, especially in the earlier stages, and in all other respects there is no deviation from the description of the type".

We wonder if Massy's material did not belong to *S. trygonina* (see p. 84) or to some other Indian Ocean species with an elongate shell, but without having seen the specimens it is impossible to come to any decision.

We have the same doubt about the specimens of *S. kobeensis* reported by Hoyle (1905, p. 982) from the Kolumadulu Atoll.

As to the shell which Adam (1939c, p. 38, pl. I, fig. 6) reported from Poeloe Weh, as belonging to *S. andreanoides*, we are almost certain that it belongs in fact to another species, perhaps *S. murrayi*.

According to Sasaki (1929, p. 203) *S. kobeensis* is "one of the commonest *Sepia* in Japan and at the same time the hardest to identify owing to its marked variation". As the specimens which he examined (p. 204), show marked variations which were not linked by intermediate forms, he separated them into six varieties "until our further knowledge on the subject should necessitate a change". Un-

fortunately the key for the identification of these varieties does not always agree with the descriptions in the text. For example: var. *typica* and var. *toyamensis* are enumerated under "Breadth of shell in female below 22% of the length", but this breadth is 24% in the former and 21–23% in the latter (see our comparative table, p. 77).

As we did not have enough Japanese material at our disposal, we are unable to discuss the value of these varieties for which we refer to Sasaki's monograph.

In the comparative table on p. 77, we have reproduced the relative measurements of the shells of most of the other small species which more or less resemble *Sepia andreana* Steenstrup. We have not included the Australian forms which the Australian authors have included in a special genus or sub-genus *Arctosepia* Iredale, whose animals are undescribed up to the present and whose shells show a different ventral surface (see p. 80 under *Sepia braggi*). In this connexion neither do we discuss species like *S. arabica* (p. 96), *S. burnupi* (p. 81), *S. trygonina* (p. 84), and *S. elongata* (p. 86) whose shells, although very slender, are distinctly different from those mentioned in the table.

Nearly all these species are Japanese; some of them have been reported from the Indian Ocean, but as we pointed out (p. 73) these records are subject to doubt. There is only one exception: *S. kiensis* (p. 78) from the Arafura Sea, which is unsufficiently known.

Unfortunately, as noted, we had only a few Japanese species at our disposal and the following discussion is principally based on Sasaki's monograph (1929).

Although the shells of most of these species resemble each other very closely, the animals may show unmistakable differences, especially the males. If we compare the shells, we have to keep in mind that those of the females are generally broader than those of the males and that the young animals have a relatively broader shell than the older ones.

Some of these species are rather difficult to compare because only the females are known (*S. kiensis*) or only the males (*S. erostrata*, *S. misakiensis*, *S. peterseni* and *S. tokioensis*).

Sepia appellöfi (p. 60) and *S. tenuipes* Sasaki (1929, p. 193, pl. XVIII, figs. 1–9) differ from all the other species in their tentacular clubs which bear uniform, minute suckers, arranged in eight series.

In the male of the latter species, the dorsal arms are about twice as long as the others, which are sub-equal. The suckers of these dorsal arms are quadriserial on the proximal halves and biserial on the effilated distal halves. On the lateral arms they are biserial at the distal tips and on the ventral ones quadriserial throughout. The left ventral arm of the male is hectocotyized, showing seven or eight transverse rows of normal suckers on the proximal half, whereas the distal half has a longitudinal furrow and minute suckers.

The arms of the female are sub-equal according to Sasaki (1929, p. 193), being "about two and a half times the dorsal length of mantle"; this statement is certainly erroneous, because his table of measurements shows them to measure 40% of the mantle-length. The suckers are biserial on the distal third of the dorsal arms and on the filiform distal half of the lateral ones, whereas they are quadri-serial throughout on the ventral arms.

The shell is rounded at the anterior end, tapering regularly towards the posterior end, which is terminated by a small, cup-shaped outer cone. The dorsal surface has a faint median rib; its median third is covered with calcareous rugosities, the coarser ones of which form longitudinal lines.

The ventral surface is convex in its greater part, with a narrow shallow median groove. The striae are convex with a small median incurvation. The inner cone is thin and narrow throughout, its posterior part scarcely prominent, enclosing a narrow depression.

According to the author (p. 194) these specimens agreed very well with Ortmann's description (1888, p. 653) of *S. andreanoides* Hoyle, so that previously he referred them to the latter species (Sasaki, 1914, p. 614). But *S. tenuipes* differs from *S. andreanoides* in the dorsal arms of the male, the lateral arms of the female, the uniform tentacular suckers and the shape of the shell. In fact, the

general form of the shell more resembles that of *S. erostrata* Sasaki, but the latter seems to have no spine, and the animal is different.

Sepia erostrata Sasaki, 1929 (p. 183, pl. XVII, figs. 7-9), is based on a small male specimen. Its dorsal and ventral arms are much longer than the lateral ones. The arm-suckers are quadriserial on the proximal part, biserial on the distal part of the lateral arms, and absent, perhaps lost, on the distal part of the dorsal and ventral arms. The suckers of the middle part of the left ventral arm are smaller than the corresponding ones of the right arm. The tentacular suckers are irregularly arranged and according to Sasaki's fig. 8, those of the third series are much larger than the other ones.

The shell is lanceolate, broadest a little in front of the middle and rounded at the anterior end. The dorsal surface is slightly convex, with a faint median rib. The ventral surface is strongly convex in the anterior part and a little concave near the posterior end. The striated area has a faint, linear, median groove and has regularly rounded striae, the last one being nearly semi-circular. The inner cone is thin and narrow throughout and the outer cone is narrow, terminating in a small cusp-like expansion "which has no marked rostrum behind but a low rounded eminence".

Sepia andreana Steenstrup, 1875 (p. 474, pl. XI, figs. 11-19) has been re-described by Sasaki (1929, p. 196, pl. I, fig. 6, pl. XVIII, figs. 12 & 13) who examined about 300 specimens, measuring up to about 120 mm in mantle-length. The dorso-lateral arms of the male are about three times as long as the others, and attain about the same length as the mantle. Their suckers are quadriserial on the proximal third, then become biserial and are finally rudimentary on the distal parts. On the lateral arms of the female, the suckers are quadriserial on the proximal two-fifths and biserial on the remaining parts.

On the dorsal arms of both sexes and the ventro-lateral ones of the male, the suckers are quadriserial except at the tips where they are biserial. On the ventral arms they are quadriserial throughout. The left ventral arm of the male is hectocotylized, its proximal half bearing 10 rows of normal suckers and its distal half only rudimentary suckers.

The tentacular suckers, of unequal size, are arranged in oblique transverse rows of eight, four in the middle attaining thrice the diameter of the marginal ones.

The shell is lanceolate, bluntly rounded at the anterior end and acuminate at the posterior end, which has a small, discoidal outer cone. The dorsal surface is convex with a faint median ridge; it is granulous and the coarser granules form longitudinal lines. The ventral surface is convex with a faint median groove along the whole length. The striae are semi-circular or triangular in the anterior part of the striated area.

According to Okada (1927, p. 177) *S. andreana* is a cold water element of the Japanese marine fauna, whereas *S. peterseni* Appellöf (1886, p. 23, pl. II, figs. 1-6, pl. III, fig. 21) is an inhabitant of temperate water.

Sepia peterseni has also been re-described by Sasaki (1929, p. 195, pl. XVIII, figs. 10 & 11, pl. XIX, fig. 27, text-fig. 109) who examined 46 male specimens, measuring up to 118 mm in mantle-length, which is about the same size as in *S. andreana*.

Its dorso-lateral arms are very long, attaining a length 4-6 times that of the mantle, but the other arms measure less than half the mantle-length. On the dorso-lateral arms the suckers are quadriserial up to the ninth or tenth rows, then they become biserial and finally form single series. On the distal halves of these arms the protective membranes are fused and no suckers can be seen externally. On the dorsal and ventro-lateral arms the suckers are obliquely quadriserial in the proximal parts, biserial in the distal, whereas they are quadriserial throughout on the ventral arms. The left ventral arm bears about 10 rows of normal suckers on the proximal part, those on the distal third being rudimentary. The tentacular club shows the suckers apparently in five or six series, but actually they form oblique transverse rows of eight; they are unequal in size, five or six in the middle being largest.

The shell is lanceolate, slender and thick, acuminate at both ends and is terminated at the posterior end by a small, cup-shaped, outer cone. The dorsal surface has a faint median rib, the median third is covered by fine calcareous granules, the coarser ones forming longitudinal lines. The ventral surface is strongly convex with a narrow, shallow, median furrow along the whole length. The striae are convex and are semi-circular at the anterior end of the striated area. The rim of the V-shaped inner cone is very narrow but at the posterior end forms a flat ledge enclosing a very narrow but relatively deep depression.

The peculiar long dorso-lateral arms are only seen in adult specimens, the young ones recall *S. andreanoides*.

Sepia tokioensis Ortmann, 1888 (p. 653, pl. XXIII, fig. 3), which has been re-described by Sasaki (1929, p. 200, fig. 110), who examined 26 males, measuring up to 88 mm in dorsal mantle-length, has a rather broad, oval body. At their posterior end, the fins are thickened and expanded into lobes, marked off from the remaining parts by notches. The arms are sub-equal, the dorsal ones being slightly longer. The arm-suckers are quadriserial.

The distal suckers of the left ventral arm are slightly smaller than those of the right arm, otherwise no hectocotylyzation is visible. The tentacular suckers are arranged in oblique transverse rows of eight, unequal in size, four or five in the middle of the club being much larger than the others.

The shell is elongate-rhomboidal in outline; it is relatively thick and terminates in a small, discoidal outer cone. The dorsal surface is convex, slightly elevated in the median line and is covered with calcareous rugosities, the coarser ones forming longitudinal lines in the lateral parts. The ventral surface is convex in the anterior parts, with a distinct, narrow, median groove. In the anterior part of the striated area the striae are semi-circular. The rim of the inner cone is very narrow; its posterior end is a little prominent, forming a flattened cone, about as long as the spine, and enclosing a narrow but relatively deep space.

The original description of this species (Ortmann, 1888, p. 653) differs from Sasaki's description in several points: the extremities of the arms being slender, the ventral arms being as long as the dorsal ones, the distal suckers are biserial, and the locular index is greater, being 36-40 instead of 26-38. In our opinion these differences are not very important, especially those concerning the arms which may be attributed to the state of preservation.

Sasaki (1929, p. 202) doubts the correctness of Berry's record of this species (1912, p. 423) from Aomori, because in this region only *S. andreana* has been found by him, the female of the latter species closely resembling *S. tokioensis*. But the table of measurements (p. 78) shows that *S. tokioensis* has a much thicker shell than *S. andreana*.

Sepia misakiensis Wülker, 1910 (p. 15, figs. 5 & 6, 19-22) was described as being closely related to *S. tokioensis* and to be perhaps only a variety of the latter. Sasaki (1929, p. 202) is of the same opinion, but his descriptions show slight differences. The body of *S. misakiensis* is more slender but the fins show the same posterior lobes. The hectocotylyzation was indistinct in the three male specimens examined by Sasaki, but Wülker states: "sie scheint in einer Verminderung der Saugnäpfe am Grunde des vierten linken Armes zu bestehen." Sasaki (1929, p. 203) describes the anterior striae of the striated area as "arcuate, with a deep indentation in the middle", which corresponds to the original figure (Fig. 19). This differs from the outline in *S. tokioensis* where they are semi-circular with only a slight incurvation in the middle.

Sepia carinata Sasaki, 1920 (p. 192, pl. XXV, fig. 2, pl. XXVI, fig. 1; 1929, p. 181, fig. 105, pl. XVII, figs. 4-6), which was based on two very young specimens from the Sagami Sea, probably does not belong in this group of species. The dorsal mantle-margin projects forward strongly and the fins are rather short. The arm-suckers are quadriserial except at the extreme bases and tips of the arms, where they are biserial. On the tentacular club the unequal suckers are arranged in oblique transverse series of eight. The shell is broad anterior to the middle and is acuminate towards both

ends. The dorsal surface is convex, flattened near the anterior end and with a faint median rib. The ventral surface has a narrow, shallow, median groove. The striated area is convex in its anterior part and separated from the outer cone by two smooth marginal zones. The striae are regularly convex. The limbs of the inner cone are narrow and the posterior portion is thickened. The outer cone is narrow in its lateral parts, forming a cup-shaped expansion at the posterior end. The spine is well developed; the author does not state if it has any keels.

COMPARATIVE TABLE OF RELATIVE MEASUREMENTS OF SHELLS OF THE *Sepia andreana*-LIKE SPECIES

Species	Distribution	Sex	L. in mm	W.	Th.	Sp.	Author
<i>S. andreana</i> Steenstrup	Japan	♂	110	15.5	6.4	—	Sasaki, 1929, p. 199
		♂	95	17	6.3	—	"
		♂	70	19.5	7.8	—	"
		♂	55	23.5	8.2	—	"
		♂	43	26.5	8.8	—	"
		♂+♀	105	21	5.7	—	"
		♂+♀	65	23	6.9	—	"
<i>S. andreanoides</i> Hoyle	Japan	♂	60	21	—	—	Hoyle, 1886, p. 140
		♂+♀	59	22	—	—	"
		♂	58	17.5	—	7.8	Sasaki, 1929, p. 208
		♂	53.5	19	—	7.4	(<i>S. kobeensis</i> var. <i>andreanoides</i>)
		♂	50	19	—	8.0	"
		♂+♀	69	18.5	—	7.2	"
		♂+♀	66.5	19.5	—	6.9	"
		♂+♀	62	19.5	—	7.4	"
<i>S. appellöfi</i> Wülker	Japan	? ♀	77	28	—	—	Wülker, 1910, p. 15
		♂+♀	89	? 27 ¹	9	—	Sasaki, 1929, p. 186
		♂+♀	74	27	9.5	—	"
		♂+♀	57	28	12.3	—	"
		♂+♀	55	25.5	10.6	—	"
		♂+♀	47	32	10.6	—	"
<i>S. erostrata</i> Sasaki	Japan	♂	45	20	9	—	Sasaki, 1929, p. 184
<i>S. kiensis</i> Hoyle	Arafura Sea	♀	37	30 ²	—	—	Hoyle, 1886, p. 142
<i>S. kobeensis</i> Hoyle	Japan	♀	42	16.5	—	—	Hoyle, 1886, p. 144
var. <i>typica</i> Sasaki	Japan	♂	31.5	22	11.1	3.8	Sasaki, 1929, p. 206
		♀	23	24	12.6	4.3	"
var. <i>toyamensis</i> Sasaki	Japan	♂	64	17	7.8	4.7	Sasaki, 1929, p. 211
		♂	62	20	9.7	4.8	"
		♂	55	22	8.2	5.4	"
		♀	70	23	7.1	4.7	"
		♀	67	21	7.5	4.5	"
var. <i>beppuana</i> Sasaki	Japan	♂	57	17.5	7.0	—	Sasaki, 1929, p. 212
		♂	52	17.5	7.7	—	"
		♂	50	18	8.0	—	"
		♂+♀	70	20	7.1	—	"
		♂+♀	58	22.5	8.6	—	"
		♂+♀	53	22.5	9.4	—	"

Table continued overleaf

¹ Sasaki mentions the width as being 14 mm; probably this is a printing error for 24 mm, otherwise the relative width would be 15.7%.

² Hoyle's figures show a width of only 24-25%.

Species	Distribution	Sex	L. in mm.	W.	Th.	Sp.	Author
var. <i>albatrossi</i> Sasaki	Japan	♂	34	20.5	11.8	4.4	Sasaki, 1929, p. 216
		♀	28	25	8.6	4.3	"
		♀	26.5	26.5	9.4	—	"
<i>S. misakiensis</i> Wülker	Japan	?	66	22	12	4.5	Wülker, 1910, pl. III fig. 19
		♂	67	25.5	12	4.5	Sasaki, 1929, p. 203
		♂	59	23.5	10.2	3.4	"
<i>S. peterseni</i> Appellöf	Japan	♂	110	14.5	—	—	Appellöf, 1886, p. 23
		♂	118	16	5.9	4.2	Sasaki, 1929, p. 197
		♂	105	16	6.2	4.8	"
		♂	92	17.5	7.6	4.4	"
		♂	77	19.5	7.8	4.5	"
		♂	59	20.5	8.5	5.9	"
		♂	58	20.5	8.6	4.3	"
<i>S. tenuipes</i> Sasaki	Japan	♂	105	18	7.1	4.8	Sasaki, 1929, p. 194
		♀	81	23.5	9.3	4.9	"
<i>S. tokioensis</i> Ortman	Japan	♂	66	19	—	—	Ortmann, 1888, pl. XXIII, fig. 3
		♂	88	20.5	9.1	4.5	Sasaki, 1929, p. 201
		♂	82	22	8.5	4.9	"
		♂	78	23	9.0	3.8	"
		♂	74	23	10.8	4.0	"
		♂	45	26.5	11.1	4.4	"

35. *Sepia kiensis* Hoyle, 1885

Sepia kiensis Hoyle, 1885, p. 194; 1885a, p. 299; 1886, p. 141, pl. XVII, figs. 6–11; Adam, 1939c, p. 39.

TYPE LOCALITY: off the Ki Islands, Arafura Sea, 5°49'15"S., 132°14'15"E., 140 fms., blue m.

MATERIAL:

a. *Holotype*: Challenger Sta. 192, 26.ix.1874; B.M. 1889.4.24.80; 1 ♀.

DESCRIPTION: The only specimen is completely hardened in alcohol and the shell damaged.

According to the original description the arm-suckers are quadriserial throughout. The hectocotylus is unknown. The tentacular club has narrow protective membranes and a swimming-membrane which extends beyond the base of the club; "the suckers are in four or five series, which are slightly larger towards the inner margin".

The anterior portion of the shell is lacking. The remaining part somewhat resembles the shell of *Sepia kobeensis*, but it is relatively broader and flatter. The dorsal surface shows a much broader calcareous area limited by two narrow, marginal ridges, as in *S. kobeensis*. The spine is the same. The inner cone is very similar, but its posterior portion is shorter and the limbs wider apart, because of the broader striated area, which has a median groove. The smooth zones between the striated area and the outer cone are much narrower. The original measurements of the shell were: 37 × 11 mm (W. = 30%) but the figures show a much narrower shell, with a width of 24–25%.

REMARKS: Without examining more material in perfect condition, especially of the male, it is impossible to decide how far this species is related to *Sepia kobeensis*.

Judging from the original figures of the shell, the general form recalls that of *Arctosepia rhoda* Iredale (1954, p. 75, pl. IV, figs. 10–12) from Point Cloates, mid-western Australia. The latter species was based on a single shell, measuring 52 × 12 × 6 mm (W. = 23%; Th. = 11.5%). The

figures are very poor, not showing any details of the striated area; a dark line in the middle of figure 12 may be interpreted as a median groove, but according to the text it has "a comparatively short, broad posterior area, well elevated and showing, instead of a linear groove, a raised rib along the striated area, but the linear groove appears in the last loculus. Practically the whole ventral area, save the extremities, is elevated".

36. *Sepia braggi* Verco, 1907
(Pl. 19, figs. 121-126)

Sepia braggi Verco, 1907, p. 213, pl. XXVII, fig. 6; Hedley, 1908, p. 134; 1918, p. M33; Gatliff & Gabriel, 1909, p. 37; May, 1910, p. 307; Chapman, 1912, p. 23, pl. I; Jackson, 1931, p. 149.
Arctosepia braggi, Verco & Cotton, 1928, p. 127; Cotton, 1929, p. 90; 1931, p. 41, fig. 9; Macpherson & Chapple, 1951, p. 156; Iredale, 1954, p. 74; Iredale & McMichael, 1962, p. 99; Hope Macpherson & Gabriel, 1962, p. 409.
Sepia (Arctosepia) braggi, Cotton & Godfrey, 1940, p. 440, fig. 428.
Sepia elongata Tate & May, 1901, p. 351 (*non* d'Orbigny, 1845).
Sepia sp. Meyer, 1909, p. 335, fig. 11.

TYPE LOCALITY: Glenelg, S. Australia.

GEOGRAPHICAL DISTRIBUTION: Australia; Tasmania.

MATERIAL:

- a. Torquay, Victoria (Australia); B.M. 1926.2.3.27-28; 2 shells.
- b. Adelaide, S. Australia; B.M. 1952.11.24.34-36; 3 shells.
- c. Semaphore, S. Australia; B.M. 1962257W; 4 shells (det. Cotton).

MEASUREMENTS:

SHELLS (IN % OF SHELL-LENGTH)

Loc.	L. in mm	W.	Th.	Str.z.	Spine	Observations
a	61.4	20	8.1	67	2.4	
	56.3	21	8.3	62	2.5	
b	56.0	20	8.0	66	3.6	pl. 19, figs. 121 & 122
	38.4	19.5	8.3	76	3.9	pl. 19, figs. 124-126
	29.0	21.5	9.0	54	3.4	
c	35.5	18.0	7.3	67	4.2	
	32.5	21.5	9.2	63	—	

DESCRIPTION: The shell is very elongate, it is broadest in the anterior third, acutely rounded at the anterior end and acuminate posteriorly. The dorsal surface has a distinct, but low, median rib, vanishing towards the posterior end; it is weakly granulous, with longitudinal lines in its anterior part and rose-coloured in its posterior part which is neatly curved towards the ventral side and terminating in a rather short spine. The latter has a constriction at its base; it is swollen on the dorsal side, turned upwards, sometimes slightly curved, and its ventral side is concave. The ventral surface of the shell shows a narrow median groove along its whole length. In the anterior part of the striated area the surface is flattened in the middle, with abruptly sloping, flat, or even concave lateral parts; the striae are regularly convex posteriorly and slightly more angular near the last loculus. The striated area is separated from the outer cone by smoother, narrow, marginal zones, separated from the striated area by the lateral limbs of the inner cone, which are long, narrow ridges, the posterior part forming a slightly sharper ledge which surrounds the posterior excavation. The narrow outer cone forms two posterior wings which surround the posterior part of the inner cone; from the latter radiate a few tiny calcareous keels over the chitinous expansion of the outer cone.

REMARKS: The shell of *Sepia braggi* differs from that of *S. kobiensis* in the less developed median rib, the weaker granulation and in the shorter posterior portion of the inner cone.

The shell of *Sepia elongata* differs in its much more elevated ventral surface, especially in the anterior third, in the more developed, differently-shaped, posterior part of the outer cone and the much longer spine which is not constricted at the base.

Up to 1926, *Sepia braggi* was the only Australian representative of these narrow shells. According to Iredale (1926, p. 193) "The only generic name in existence is *Doratosepion* Rochebrune proposed for the Japanese species *S. andreana* Steenstrup".

He forgets to mention that Rochebrune (1884, p. 97) also included in this genus two species from the Red Sea: *D. elongatum* and *D. trygoninum*. In the diagnosis of *Doratosepion* the shell is described (p. 95) as being: "excessivement allongé, étroit, à l'extrémité postérieure présentant deux ailes généralement coupées à angle droit formant une sorte de capuchon variable d'aspect et surmonté d'un rostre plus ou moins long très aigu et conique." In Iredale's opinion there appears to exist more than one generic form "and it is suggested that at least a subfamily is necessary to include these Cephalopods. In order to enable correct study of the Australian animals to be undertaken, I therefore propose the new generic name *Arctosepia* and name *A. limata* as type". The original diagnosis of this genus, the animal of which is still unknown, describes the shells as "very small, very narrow, ventrally swollen, posteriorly sweeping forward and narrowing, a chitinous outer cone appearing as a hood, the spine rounded and more or less curved, inner cone missing, fusing with the edges of the striated area". According to this diagnosis nothing permits us to separate *Arctosepia* from *Doratosepion*. The statement "inner cone missing" is very confusing: if it is missing how can it fuse with the edges of the striated area? Moreover Iredale's figures (pl. XXIII, figs. 6 and 8) show an inner cone.

The type-species of *Arctosepia*, *A. limata* Iredale (1926, p. 193, pl. XXIII, figs. 7 & 8) from Manly Beach, New South Wales, is said to differ from *S. braggi* in being smaller "proportionately broader, less narrowed posteriorly, different shape, etc." The slightly broader shell, which may be a sexual character, does not seem to justify the specific separation. The same seems to be true for Iredale's second new species, *A. versuta* (p. 194, pl. XXIII, figs. 5 and 6).

In 1954, Iredale (p. 74) discussed the species of *Arctosepia* again. Under *A. braggi*, he states:—

"It was suggested that in this section two series could be distinguished, and the name *Arctosepia* was introduced for the small forms found on the New South Wales coast. A larger bone has been named *Sepia braggi* from South Australia, and this larger form is not able to be confused with the typical *Arctosepia*. It has been given a range of Victoria, Tasmania, South Australia and Western Australia, and now I add it to the New South Wales faunula, as Whitley has collected a specimen at Narooma, on the South coast. The complex *braggi*, as admitted above, may be capable of subdivision, when studied geographically."

Iredale (1954, p. 74, pl. V, figs. 19–21) has created a new sub-species: *A. braggi xera* for shells from N.W. Tasmania.

Compared with *S. braggi* it is described as being larger:—

"more elongate, with a wider posterior area, which shows a median linear groove its whole length, even on the last loculus. The dorsal rib is very faint posteriorly, but well indicated anteriorly, while the horny margin is easily seen throughout its length. The posterior horny hood is small."

The type measures 78×16 mm (20.5%), other specimens: 51×12 mm (23.5%), 57×14 mm (24.5%); 68×15 mm (22%), 73×16 mm (22%), 74×15 mm (20.5%) and 80×17 mm (21.5%). Under *A. limata*, Iredale (1954, p. 74) states that hundreds of these small bones have been collected but none exceeding the measurements of the type, 36×8 mm (22%), in the Sydney district. Other

specimens have been found on the north coast of New South Wales and South Queensland.

"These small bones may occur further north, as they are easily overlooked, and the northern bones might belong to different species."

Macpherson & Chapple (1951, p. 156) mention it from Victoria.

Under *Arctosepia versuta*, Iredale (1954, p. 75) states:—

"In Southern Australia, large shells (for the group) occur with the name *braggi*, and it would appear that these small New South Wales shells are degenerate representatives of the larger one. Thus, Whitley collected a series of *braggi*-like bones in North-western Tasmania, and while most of these are obviously of the true *braggi* style, some others are of the *versuta* form, and appear to be far larger relatives."

In our opinion all this is very confusing; we have never seen any "degenerate" Cephalopods. Iredale (1954, p. 75) states that compared with *A. limata*, the shell of *A. versuta* is:—

"smaller, the growth lines more closely packed, the posterior end much less rapidly tapering, the anterior ventral more swollen, less excavate posteriorly, and with more numerous striae"; we do not know which of these characters the author considers as an indication of degeneration. For the specimens from Tasmania mentioned above he creates a new species *Arctosepia treba*. These shells measure: 51×10 mm (19.5%) and 48×10 mm (21%); they are:—

"elongate and narrow, the width never increasing rapidly, the ventral surface elevated, the median furrow in one specimen elevated into a rib, in the other normal, the striae rather coarse, the hood small, the spine short and thickened, the dorsal area smoothish, the median rib scarcely indicated."

The author adds that this species may have been confused elsewhere with *braggi*, passing as the male or immature. Finally, Iredale (1954, p. 75 pl. IV, figs. 10–12) describes a new species: *Arctosepia rhoda*, based on a shell collected at Point Cloates, Mid-western Australia. It measures $52 \times 12 \times 6$ mm (W. = 23%; Th. = 11.5%) and judging from the figures it certainly differs from the above-mentioned species, being much more oval, like our *Sepia sewelli* (p. 62) and like *S. kiensis* (p. 78). According to the original description it has:—

"a comparatively short, broad posterior area, well elevated and showing, instead of a linear groove, a raised rib along the striated area, but the linear groove appears in the last loculus. Practically the whole ventral area, save the extremities, is elevated. The dorsal area is comparatively smooth, with a narrow median elevated rib, and with a large amount of horny margin on the sides exposed. The spine is of the usual rounded style, while the hood is small."

Unfortunately the author does not describe the inner cone, which judging from his fig. 12 resembles that of *Sepia kobiensis*.

As long as the animals of all these species are unknown it is useless to discuss their status and their relationships. It is most unfortunate that Garrard (1961, p. 36) who mentions 13 live specimens of *Arctosepia versuta*, collected off the coast of New South Wales in 76–80 fms., and 96 fms. depth, did not describe the animals.

37. *Sepia burnupi* Hoyle, 1904 (Pl. 20, figs. 127 & 128)

Sepia burnupi Hoyle, 1904 (pars), p. 27, pl. I, figs. 188 & 189; Smith, 1916, p. 23, pl. II, fig. 5; ? Turton, 1932, p. 1.
Sepia (*Doratossepion*) *incerta* Massy, 1925, p. 219, pl. XIII, figs. 22, 23, 29–36; pl. XIV, figs. 40 & 43 (*non* Smith, 1916).
? *Sepia exsignata* Barnard, 1962, p. 250, fig. 3.

TYPE LOCALITIES: Umkomaas, Natal (*S. burnupi*); off Umhlanga River, Natal, 22–26 fms. (*S. exsignata*).

GEOGRAPHICAL DISTRIBUTION: South Africa.

MATERIAL:

a. Umkomaas, Natal (Burnup); B.M. 1905.1.19.5; 1 shell (holotype).

b. Umkomaas, Natal (Ponsonby); B.M. 1904.2.13.5; 1 shell (paratype).

MEASUREMENTS:

SHELLS (IN % OF SHELL-LENGTH)

Loc.	L. in mm	W.	Th.	Str.z.	Spine	Observations
a	49	20	6.1	±67	3.5	Holotype
b	45	19	6.7	—	3.3 ⁺	Paratype, pl. 20, figs. 127 & 128

DESCRIPTION: The shell is elongate, broadest in its anterior third and the posterior end is regularly curved towards the ventral side. The dorsal surface has a distinct median rib, limited by two narrow grooves, and has rather broad chitinous margins, the rest of the surface being finely granulous, but coarser in the posterior part where the granules form longitudinal lines. The ventral surface is not very thick, with a distinct median groove along its whole length. Two broad ribs separate the median part of the striated area from the two concave marginal zones which are less distinctly striated. The striae are convex in the anterior part and more and more angular towards the anterior end of the striated area. The limbs of the inner cone are narrow, slightly raised, forming a rounded ridge in the posterior part which surrounds a faint excavation. In the posterior part the limbs separate the central part of the striated area from the marginal zones; anteriorly they descend on these zones. The outer cone is narrow, forming two wings at the posterior end which together form a shallow calcareous expansion, surrounding the inner cone. The spine is gently curved upwards, without any keels.

The female animal has been described by Massy (1925, p. 219) as "*Sepia (Doratosepion) incerta*". It has short, sub-equal arms, with the suckers arranged four in a row, the median ones being largest; "frequently a 2- or 3-rowed series persists for a portion of an arm". The arms are much attenuated at the tips.

The tentacular club has five very large suckers of which the median three are the largest. The colour of the preserved animal is dull purplish-pink, the surface is smooth.

The relative measurements of these two females are:—

M.L.d. in mm	M.W.	H.W.	A.L. I	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.
90	49	33	54	58	64	60	142	16.5
80	54	30	45	61	56	62	—	—

The shell of the largest animal has a width of 24.5%.

REMARKS: In his original description of *S. burnupi*, Hoyle (1904, p. 27) confused three different species which were separated afterwards by Smith (1916, pp. 23–24) as *S. burnupi*, *S. incerta* and *S. confusa*. The latter author submitted his conclusion to Hoyle, who agreed that there were three forms, but who stated that *S. incerta* was the female form of *S. burnupi*. At that moment only the shells of these species were known.

The animal of *S. confusa* was described by Massy & Robson (1923, p. 435) and by Robson (1924a,

p. 647). Unfortunately in her descriptions of the two other species, Massy (1925, p. 215 and p. 219) described the animal of *S. burnupi* as *S. incerta*, and that of *S. incerta* as *S. burnupi*.

Probably this mistake was due to Hoyle's statement, because Massy (1925, p. 217) mentions: "it is significant that the present collection has produced 2 males of *S. burnupi* and 2 females of *S. incerta* E. A. Smith, which is a short-armed species." There is not the slightest doubt that the shell figured by Massy (1925, pl. XIII, fig. 34) as being *S. incerta* belongs in fact to *S. burnupi*. Our interpretation of these three species is substantiated by our descriptions and figures of the original and other material (p. 82).

The shell of *S. burnupi* is very closely related to that of *S. trygonina* (Rochebrune, 1884, p. 97, pl. V, fig. 1). Until now the male of *S. burnupi* has never been described, but we are almost certain that the males recently described by Barnard (1962, p. 250, fig. 3) as belonging to a new species, *S. exsignata*, are in fact *S. burnupi*. Barnard (p. 251) gives the following description of the shell of his new species:—

"Shell resembling that of *burnupi* Hoyle (as restricted by Smith, 1916, p. 23, pl. 2, fig. 5). A low medio-dorsal ridge defined by shallow grooves, growthlines V-shaped. Striated area extending about $\frac{3}{4}$ the length, with deep median groove, striae more strongly V-shaped anteriorly than posteriorly, last locus with minute obliquely-longitudinal striae; limbs of inner cone prominent, nearly parallel but diverging slightly; external to the limbs the chitinous margin is marked with curved striae (cf. Smith, 1916, p. 23, for *burnupi*)."

As Barnard (1962, p. 252) followed Massy's erroneous interpretation of *S. burnupi*, he thought that "no excuse is needed for introducing another specific name". The animals he studied were very small, the female 36 mm in dorsal mantle-length, the male 44 mm.

Unfortunately he does not give other measurements. The fins are separate posteriorly, rounded in the female and ending in small points (2–3 mm) in the male. The dorsal mantle-margin is not strongly produced, "as in Massy's figure of *incerta* (1925, pl. 13, not her figure of *burnupi*, pl. 12)".

In the female the dorsal and lateral arms are sub-equal, the ventral ones about $1\frac{1}{4}$ times longer, in the male the dorsal arms are "about $1\frac{1}{3}$ longer than lateral arms, and ventral arms about $1\frac{1}{4}$ longer than the dorsal arms". The suckers are quadriserial.

The dorsal arms of the male show a very peculiar transformation:—

"proximally with 6 or 7 rows of normal-sized suckers, but thereafter decreasing in size, becoming minute and eventually obsolete; the inner protective membrane has about 10–12 small points, the outer membrane has about 16–18 cirriform processes, the middle and distal ones of which originate in the mid-line of the arm and alternate with the bases of the points on the inner membrane."

The ventral arms are also transformed. In one of the males the right ventral arm:—

"has about 10 rows of normal suckers, thereafter the suckers begin to decrease in size, reduced to 3 in a row, and eventually to 2 rows of minute suckers, tip with 5 cirri. The left arm in this ♂ is similar but shows signs of hectocotylization: 4 thickened membranes on ventral margin, and tip with 8 cirri. The other ♂, although of the same size, is more developed: the right ventral arm has 7 cirri; the left ventral arm has 8 or 9 thickened ridges forming an expansion on the ventral margin, and 8 cirri on the tip."

The tentacular club has four enlarged suckers, the arrangement of the other ones is not described. We do not understand Barnard's statement (p. 252):—

"As regards the so-called 'species' *burnupi*, *incerta* and *confusa*, it must be admitted that up to the present we are dealing with *specimens* only, not species with well-defined and constant characters."

In fact, these three species are very well defined and easily distinguishable.

38. *Sepia trygonina* (Rochebrune, 1884)
(Pl. 20, figs. 129-131; pl. 37, figs. 220-221; pl. 46, fig. 277)

Doratossepion trygoninum Rochebrune, 1884, p. 97, pl. V, fig. 1; Adam, 1944, p. 228.

TYPE LOCALITY: Red Sea.

MATERIAL:

- a. John Murray Exped. Sta. 10, 13°31'N., 42°31'E., Red Sea, 55 m, 17.ix.1933:1 ♂. B.M. 196386W.
- b. John Murray Exped. Sta. 13, 12°12'30"N., 43°45'30"E., Gulf of Aden, 413 m, 19.ix.1933:1 ♂ ($L_M = 17.2$ mm)¹. B.M. 196387W.
- c. John Murray Exped. Sta. 27, 11°57'12"N., 50°35'00"E. to 11°56'42"N., 50°39'12"E., Gulf of Aden, 37 m, 12.x.1933: 2 ♂, 5 ♀. B.M. 196388-94W.
- d. Ennûr, 1929 (Coll. Winckworth); 2 shells (identified by Winckworth as *S. kubiensis* Hoyle = *S. andreanoides* Hoyle). B.M. 1952.11.24.32-33.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL-MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
c	♂	43	86	43	21	32	79	9.5	—
a	♂	40	90	39	17.5	37	85	9	15
c	♂	37	89	46	22	36	81	8	19
c	♀	50	82	40	22	34	80	8	28
c	♀	50	78	45	28	30	76	5	28
c	♀	33	91	41	24	38	—	—	30

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
c	♂	43	32	26	30	—	—	0.95	—
a	♂	40	25	25	27	75	10	1.0	1.2
c	♂	37	27	27	27	122	9.5	0.8	1.1
c	♀	50	32	32	32	130	9	1.0	1.0
c	♀	50	32	34	32	150	9	1.0	1.2
c	♀	33	30	30	30	136	12	0.9	1.2

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
a	♂	40	21	8.5	65	3.5	
c	♂	43	23	7.0	65	3.5 ⁺	
c	♂	37	23	9.2	65	2.7 ⁺	
c	♀	50	22	8	68	4.0	
c	♀	50	21	7.6	72	4.0	pl. 20, figs. 129-131
c	♀	38	25	9.2	63	3.9 ⁺	
d	—	47	22	6.4	73	—	

DESCRIPTION: The body is elongate oval but acuminate behind; the dorsal mantle-margin is acutely angular, reaching the mid-level of the eyes and the ventral margin is slightly emarginate.

¹ The station list gives a depth of 413 m for this station, but the tube is labelled 16 fms. and the date is given as 17.ix.33.

The fins begin a few millimetres behind the mantle-margin and do not reach the posterior end of the body (pl. 37, figs. 220 & 221).

The arms are sub-equal in length, the web is rather low, but is highest between the dorsal arms and between the dorso-lateral and ventro-lateral ones. All the arms are laterally compressed, the dorsal ones of the female specimens are rounded or have slight keels on the outer side of the distal halves, the dorso-lateral ones have keels along the whole of the ventral margins, the ventro-lateral ones have distinct but low swimming-membranes and the ventral ones have broad outer swimming-membranes. In the males the dorsal arms are much shorter than the other ones and are keeled over their whole length.

The suckers are quadriserial on all the arms of the males and on the dorsal and ventral arms of the females; on the lateral arms of the latter the suckers are quadriserial on the proximal two-thirds, but on the distal third they are arranged in two, widely-spaced, longitudinal series on each arm.

The ventral portion of the buccal membrane is not expanded in the female.

The tentacular club is rather short, with a well developed swimming-membrane on the dorsal side, extending beyond the base of the club (pl. 46, fig. 277). The dorsal protective membrane is broad and is separated from the ventral membrane at the base of the club. The suckers seem to be arranged in five longitudinal series, but in fact they are arranged in very oblique transverse rows of eight. The third longitudinal series bears about five very large suckers.

All the tentacular suckers have their chitinous rings finely dentate all around; the arm-suckers are dentate only on the distal halves of their rings.

The left ventral arm of the male is hectocotylized. In the largest male the proximal half of this arm is normal with about six rows or groups of four suckers; these are followed by a transformed portion of about 2 mm which is nearly completely devoid of suckers, its surface is hollowed out and covered by the large, wrinkled, protective membranes; the distal part of the arm has the normal arrangement. In the smallest male, the hectocotylus possesses, at its base, one pair of suckers, a group of three suckers and three transverse rows of four, occupying the basal third of the arm. On the middle third nearly all the suckers have disappeared, the protective membranes are larger, especially the ventral one which is thick and curved outwards; the whole transformed portion is transversely grooved. The distal third of this arm gradually narrows considerably and its surface is grooved, with a few minute suckers along its margins. This hectocotylus differs only slightly from the one described by Adam (1959, p. 147, fig. 8A) for *S. elongata*.

The third male has two groups of three and four groups of four normal suckers at the base of the hectocotylus, the distal half is nearly completely devoid of suckers, its surface is concave with transverse grooves and ridges, especially in the ventral part where the protective membrane is thick and curved outwards; the distal portion has only a few minute suckers on the dorsal side.

The specimens from the John Murray Expedition have elongate shells, these are broadest in the anterior third, the posterior ends are regularly curved towards the ventral side (pl. 20, figs. 129-131). The dorsal surface shows a faint indication of a low median rib and rather wide chitinous margins, the rest of the surface being finely granulous, forming a few longitudinal lines near the outer part of the granulous surface in the posterior half of the shell. The ventral surface is not very thick; it has a rather wide median groove along its whole length, this groove becoming wider in the anterior part of the last loculus. Two broad ribs separate the median part of the striated area from the two marginal zones which are concave over their whole length and are less distinctly striated. The striae of the central part are weakly convex at the posterior end, more and more rounded near the middle portion, and angular towards the anterior end of the striated area. The limbs of the inner cone are narrow, slightly raised, and form a rounded ridge at the posterior end. In the posterior part the limbs are situated at the margins of the central striated area, but from about one-third of the length of this area on they descend on the marginal zones and are finally situated in the middle of these zones.

The outer cone is narrow, forming two wings at the posterior end which together form a slightly concave calcareous expansion surrounding the inner cone. The spine is gently curved upwards and is without any keels. The dorsal surface of the shell is pinkish, the anterior part of the striated area darker reddish and the last loculus irregularly tinged with red.

In the two shells from Ennûr only the posterior part of the dorsal surface is of a dark reddish colour.

The smallest male specimen from the Gulf of Aden (*c*) has a reddish-purple colour in alcohol. Near the base of the fins, at the margins of the dorsal mantle-surface, there is a series of elongate tubercles; on the outer side of these there is a dark purple band and, next to it or partly on it, a series of small oval or circular cream-coloured patches, often raised as low tubercles.

REMARKS: The shell of this species differs only in one respect from that of *S. burnupi*, the latter having a well-defined mid-dorsal rib. The only animals known of *S. burnupi* are the two female specimens described by Massy (1925, p. 219) as "*Sepia (Doratosepion) incerta*", unfortunately not in sufficient detail to compare them with *S. trygonina*.

As the type of *S. trygonina* seems to be lost, it is impossible to verify our identification, but we are almost certain that the specimens described above belong to this species which has never been reported since the original description.

Adam (1944, p. 228) advanced the hypothesis that *S. trygonina* might have been the female of *S. elongata*, but this opinion is invalidated if our present identification is correct.

The tentacular club and the hectocotylus resemble those of *S. elongata* very closely (see Adam, 1959, p. 147), but the shell of the latter species has its anterior part much thicker and a different formation of the striated area and of the inner cone (see pl. 21, figs. 132 & 133).

39. *Sepia elongata* d'Orbigny, 1845 (Pl. 21, figs. 132 & 133)

Sepia elongata d'Orbigny, 1845, p. 289, pl. 13, figs. 7-10; Férussac & d'Orbigny, 1848, p. 283, pl. 24, figs. 7-10; Adam, 1941c, p. 1; 1942, pp. 3, 9; 1944, p. 237; 1959, p. 145, figs. 7 & 8; pl. IV, fig. 5.
Doratosepion elongatum, Rochebrune, p. 97; Adam, 1944, p. 228.

TYPE LOCALITY: Near Cosseir, Red Sea.

GEOGRAPHICAL DISTRIBUTION: Red Sea.

DESCRIPTION: This species is only known from the type shell (pl. 21, figs. 132 & 133) and from a male specimen measuring 97 mm in dorsal mantle-length, described by Adam (1941c, p. 1; 1959, p. 145) from the Gulf of Aqaba.

The mantle is elongate, acuminate at the posterior end, and with the dorsal margin slightly projecting. The narrow fins do not reach the posterior end of the body. All the arms are laterally compressed, having outer keels and narrow protective membranes. The suckers are quadriserial, the median ones being slightly larger than the marginal ones. The left ventral arm is hectocotylized in a rather peculiar way. In the middle part of this arm the ventral protective membrane is enlarged on a length of about 4 mm; it attains a width of about 5 mm and has its free margin curved towards the inner side. At the same level the dorsal protective membrane is slightly enlarged. This transformed portion has seven transverse ridges devoid of any suckers. The proximal and distal parts of the arm bear normal suckers which are irregularly arranged.

The small crescent-shaped tentacular club has a well developed swimming-membrane which extends beyond the base of the club; the protective membranes are narrow and separated at the base.

The tentacular suckers are unequal, irregularly arranged, with a series of five big suckers in the middle; the diameter of the latter reaches about two-thirds of the width of the club.

The shell is very elongate, the width measuring 16% of the length, the thickness 11.7%. The dorsal surface is rather flat with a barely indicated median rib which shows a faint median furrow. The spine is strong, rounded, without any keels and nearly straight. The ventral surface is strongly convex in its anterior portion; it has a narrow furrow along its whole length. The inner cone is sharply V-shaped with narrow limbs which are slightly elevated as rounded ridges, situated on the lateral parts of the striated area. The outer cone forms an elongate-oval posterior expansion separating the inner cone from the spine.

REMARKS: This species seems only to occur in the Red Sea, the Australian records should be referred to *S. braggi* (see p. 79).

Its tentacular club and hectocotylus closely resemble those of *S. trygonina* (p. 86), but the shell differs in its much thicker ventral surface and in the median part of the striated area, which has a wide groove in *S. trygonina*, and in the limbs of the inner cone—situated on the lateral parts of the striated area in *S. elongata*, and not separating the three zones of the striated area as in *S. trygonina*.

40. *Sepia mira* (Cotton, 1931)

Tenuisepia mira Cotton, 1931, p. 546, figs. 7–9; Iredale, 1954, p. 75, pl. V, figs. 7 & 8; Iredale & McMichael, 1962, p. 99.

TYPE LOCALITY: North-West Islet, Capricorn group, Queensland.

GEOGRAPHICAL DISTRIBUTION: Queensland; New South Wales.

DESCRIPTION: This species is not represented in the collections of the British Museum. It has been described from a single shell, measuring 55 mm in length, 10.6 mm in width and 4 mm in thickness. It is elongate, sharply rounded at the anterior end, widest at the anterior third, slightly tapering towards the posterior end, but again broadly rounded at the posterior end of the outer cone. The spine is 1.7 mm long; it is straight and rounded, without any keels. The dorsal surface is cream-coloured, without ribs or furrows, and is smooth except for a finely pustulose area near the posterior end; the chitinous margin is narrow. The ventral surface is convex for the greater part of its length, with a very long striated area, devoid of a median groove. If the original drawing is correct, the striated area seems to be composed of a slightly convex central part and two abruptly sloping lateral zones. The inner cone is described as "much reduced". The outer cone, which passes "in front of the spine as a thin, projecting ledge, forms two long wings, without forming the cup-shaped expansion seen in *Sepia braggi* and allied forms of the latter".

REMARKS: This species is the type of a new genus *Tenuisepia*, which according to the author shows only affinity with *Decorisepia*, the type of which, *D. rex* Iredale, 1926, "is more than twice as large, much broader, and has the dorsum strongly three-ribbed".

As the animal is unknown, it is impossible for the moment to discuss the question whether these differences can even be considered as being of sub-generic value.

41. *Sepia orbignyana* Férussac, 1826 (Pl. 21, figs. 134–137)

Sepia orbigniana Férussac (in d'Orbigny), 1826, p. 156.

Sepia orbignyana, Férussac & d'Orbigny, 1835–1848, p. 273, pl. 5, pl. 27, figs. 1 & 2; Adam, 1952, p. 28, figs. 9 & 10, pl. II, figs. 1 & 2; 1960, p. 467; 1962, p. 14.

Acanthosepion orbignyanum, Rochebrune, 1884, p. 104; Adam, 1944, p. 231.

Sepia (*Parasepia*) *orbignyana*, Naef, 1923, p. 555, figs. 310–314.

Sepia rubens Philippi, 1844, p. 203.

Sepia elegans Vérany, 1851, p. 70, pl. 26, figs. a–c; Tiberi, 1880, p. 25; Jeffreys, 1869, p. 140 (*non* Blainville).

Acanthosepion enoplion Rochebrune, 1884, p. 108; Adam, 1944, p. 233.

TYPE LOCALITIES: La Rochelle (France) (*S. orbignyana*); Sicily (*S. rubens*); Mediterranean (*S. enoplion*).

GEOGRAPHICAL DISTRIBUTION: Eastern Atlantic coasts from Arcachon to 17°27'S.; Mediterranean.

DESCRIPTION: We have not revised the material in the collections of the British Museum, but as this species occurs in the southern Atlantic as far south as 17°27'S. (Adam, 1962, p. 13) and perhaps even further, we give a brief description based on Adam's report (1952, p. 28), who examined six ♂ and 17 ♀ specimens¹ collected in 116–430 m depth. Jatta (1896, p. 156) reported it from 30–100 m depth in the Mediterranean, but other authors mentioned it at greater depths: Monaco, 141 m (Joubin, 1920, p. 48), Arcachon, 140 m (Joubin, 1920, p. 48), north of the Arguin Bank, 140 and 235 m (Fischer & Joubin, 1907, p. 333).

The largest male specimen from the southern Atlantic measured 86 mm in dorsal mantle-length; the largest female was 94 mm in dorsal mantle-length.

The mantle is oval, little more than twice as long as broad, its dorsal margin projects strongly in a sharp angle. The sub-equal arms are rather short; those of the male are slightly longer than those of the female, attaining nearly 45% of the mantle-length. All the arms are laterally compressed, with outer keels. The protective membranes are narrow, especially on the left ventral arm of the male. Except for a few suckers at the base, all the arm-suckers are arranged in oblique transverse rows of four, the median ones being wider than the lateral ones. There seems to be a biserial arrangement of the suckers, especially on the tips of the dorsal arms, but in fact this arrangement is quadriserial. The hectocotylus has exactly the same structure as in *S. elegans*, with about a dozen transverse rows of four minute suckers, both the dorsal and the ventral suckers forming a longitudinal zigzag series on more than two-thirds of the arm-length.

The tentacular club closely resembles that of *S. elegans*. Its swimming-membrane extends beyond the base of the club. The latter bears about a hundred suckers, three of these in the middle being much larger than the others and also some of the dorsal ones are somewhat larger than the remaining ones. The suckers are apparently arranged in four to five longitudinal series, but it may be that there are very oblique transverse rows of eight; the biggest suckers belong to the third longitudinal series.

The oval shell is rather acuminate at its anterior end and bluntly rounded at the posterior end which bears a strong spine; this is directed slightly upwards and has a ventral keel (pl. 21, figs. 134–137). The width of the shell measured 32–33% in three males, and 33.5–35% in five females; in a small female of 32 mm length, it measured 43.5%. The thickness of the shell did not show any sexual difference being 9.5–11.5% of shell length.

The dorsal surface of the shell is rose- or orange-coloured, without any median rib but with a faint median-groove². It is finely granulous, with narrow chitinous margins. The ventral surface is slightly convex, with a very faint, narrow, median groove and two large, longitudinal, lateral depressions in the striated area, the striae of which are wavy, being more or less reversed W-shaped in their general outline. The limbs of the inner cone are very narrow and flat. The outer cone forms two distinct posterior wings, united behind the inner cone by a chitinous callus.

The female has a single median receptaculum seminis (spermatheca) in the ventral expansion of the buccal membrane.

REMARKS: The animals of *S. orbignyana* and *S. elegans* seem to be closely related, but the shells are distinctly different.

In the older literature there is much confusion in the nomenclature of these two species (see

¹ In Adam's report (1952, p. 29) the total numbers of specimens were erroneously indicated as 6♀ and 17♂.

² In the "Dautzenberg-collection" (Inst. Roy. Sci. Nat. Brussels) there is a shell from unknown locality which resembles *S. orbignyana* in all respects and which has no median groove but a faint rib. On p. 55 we mentioned some shells, which may belong to *S. acuminata*, that possess a median groove instead of a rib.

Adam, 1952, p. 28) which some authors even interpreted as the two sexes of a same species (Forbes & Hanley, 1852, p. 241).

42. *Sepia australis* Quoy & Gaimard, 1832
(Pl. 21, figs. 138-142; pl. 45, fig. 270)

Sepia australis Quoy & Gaimard, 1832, p. 70, pl. 5, figs. 3-7; Adam, 1941, p. 117, pl. IV, fig. 5; 1959, p. 149; Voss, 1962b, p. 252.

Sepia (Dorotosepion) australis, Massy, 1925, p. 214.

Rhombosepion australe, Rochebrune, 1884, p. 85; Adam, 1944, p. 223.

Rhombosepion australis, Massy, 1927, p. 156.

Sepia capensis d'Orbigny, 1845, p. 283; Férussac & d'Orbigny, 1835-1848, p. 278, pl. 7, figs. 1-3, pl. 12, figs. 7-11, pl. 17, figs. 18 & 19; Thiele, 1920, p. 438, pl. LII, fig. 14, pl. LIII, figs. 1-5.

Rhombosepion capense, Rochebrune, 1884, p. 85; Robson, 1924, p. 641, fig. 24; Adam, 1944, p. 222.

Sepia sinope Gray, 1849, p. 106.

TYPE LOCALITIES: Agulhas Bank (*S. australis*), Cape of Good Hope (*S. capensis*),[?] China (*S. sinope*).

GEOGRAPHICAL DISTRIBUTION: South Africa¹ (from Dassen Island to Port Alfred); Red Sea.

MATERIAL:

- a. ? China; 1 shell (type of *S. sinope*); B.M. 196385W.
- b. Port Elizabeth (Ponsonby); B.M. 1892.1.19.10; 1 shell (figured by Smith, 1916, pl. 2, fig. 9).
- c. Port Elizabeth (Ponsonby); B.M. 1892.12.8.1; 1 broken shell.
- d. Cape Town (Gilchrist, Sta. 20); B.M. 1924.9.9.61 (det. Robson as *S. capense*); 3 ♂ ($L_M = 53, 54$ and 55 mm).
- e. Cape Town (Gilchrist, Sta. 9); B.M. 1924.9.9.62-69 (det. Robson as *S. capense*); 6 ♀, 2 ♂.
- f. Cape Town; 1924.9.9.62-71. (det. Robson as *Rhombosepion capense*); 3 shells (poor condition).
- g. Cape St. Blaize, N 36 miles (P.F. 1866, No. 1307), shrimp trawl, 54 fms., sand and shingle; B.M. 1926.10.20.2-3. (det. Massy, 1927); 2 ♀ ($L_M = 44$ and 38 mm).
- h. Off Sebastian Bay, Cape Infanta, E. by N. $\frac{3}{4}$ N. $4\frac{3}{4}$ miles (P.F. 6051, No. 1260/23), shrimp trawl, 35 fms., mud; B.M. 1926.10.20.4. (det. Massy, 1927); 1 ♂ ($L_M = 34$ mm).
- i. Gericke Point, N. by E. $\frac{1}{4}$ E. 5 miles (P.F. 10404, No. 1265), shrimp trawl, 35 fms., fine sand; B.M. 1926.10.20.6. (det. Massy, 1927); 1 ♀ ($L_M = 39$ mm).
- j. Cape Infanta; NE. by N. 19 miles (P.F. 8046, No. 1255), shrimp trawl, 46 fms., sand and shingle; B.M. 1926.10.20.9. (det. Massy, 1927); 1 ♂ ($L_M = 36$ mm).
- k. Cape Point Lighthouse, W. $\frac{1}{4}$ S. $9\frac{1}{2}$ miles (P.F. 15577), shrimp trawl, 32 fms., fine sand; B.M. 1926.10.20.10-11. (det. Massy, 1927); 2 ♂ ($L_M = 29$ and 26 mm).
- l. Off Mossel Bay, $34^{\circ}14'S.$, $22^{\circ}23'E.$ (P.F. 99), shrimp trawl, 36 fms., mud; B.M. 1926.10.20.22. (det. Massy, 1927); 1 ♂ ($L_M = 36$ mm).
- m. Cape St. Blaize (S. Afr. Mus.); B.M. 1926.10.20.49; 2 shells (poor condition).
- n. Grahamstown, Natal (Tomlin); B.M. 1952.11.21.31; 1 shell (pl. 21, figs. 138-139).
- o. S. African Coast, $31^{\circ}43'S.$, $16^{\circ}13'E.$, 250 fms., 9.vi.1947 (Afr. 716H, J.H. Day); B.M. 1958.8.20.4; 1 ♀.

¹ According to Barnard (*in litt.*) the S. African Museum has specimens from off Cape Natal (Durban), 54 fms.

MEASUREMENTS:

ANIMALS (IN % OF MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
<i>e</i>	♂	55	82	42	22	40	84	11	35
	♂	48	83	44	23	42	79	10.5	31
	♀	55	84	44	22	40	80	11	29
	♀	53	81	45	21	38	81	11	26
	♀	53	83	45	23	40	76	7.5	28
	♀	48	85	50	23	42	79	10.5	31
	♀	41	83	49	24	44	78	12	27
	♀	40	85	47	23	45	80	12.5	27
<i>o</i>	♀	54	82	43	20	37	83	11	26

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>e</i>	♂	55	33	31	33	91	11	2.18	2.0
	♂	48	31	33	35	83	12.5	2.30	1.88
	♀	55	29	31	29	91	12.5	1.64	2.0
	♀	53	28	28	28	85	12	1.70	2.07
	♀	53	28	28	30	76	12	1.70	2.07
	♀	48	31	33	33	104	13.5	1.88	2.30
	♀	41	27	27	27	98	12	1.95	2.20
	♀	40	27	27	27	100	15	2.00	2.50
<i>o</i>	♀	54	28	28	30	83	14	1.85	2.22

SHELLS (IN % OF SHELL-LENGTH)

Loc.	L. in mm	W.	Th.	Str.z.	Spine	Observations
<i>n</i>	56.5	29	6.5	74	3.5	pl. 21, figs. 138 & 139
<i>b</i>	42	29	7.6	67	3.6	

DESCRIPTION: The specimens from Cape Town (*e*), which Robson (1924, p. 641) described as *Rhombosepion capense*, are in rather good condition. The body is acuminate at the dorsal mantle-margin and at the posterior end. The fins begin several millimetres behind the mantle-margin and extend beyond the posterior end of the mantle where they are widely separated. The mantle is darkly pigmented on the ventral side, especially near the fins; the latter are cream-coloured each with a thick orange ridge at its dorsal base. The arms are laterally compressed and keeled on their outer sides. The suckers are quadriserial, the median ones being much larger than the marginals. The interbranchial web is rather shallow and sub-equal between the dorsal, dorso-lateral and ventro-lateral arms, and more reduced between the ventro-lateral and ventral ones. The tentacular club is short; the swimming-membrane extends slightly beyond the base of the club (pl. 45, fig. 270). The suckers are arranged in about five longitudinal rows, those of the middle row being much larger than the other ones. The narrow protective membranes are separated at the base.

In the male, the difference in size between the median and marginal arm-suckers is more pronounced than in the female. The left ventral arm is hectocotylized and has at its base two pairs of normal suckers, followed by 13 slightly alternate pairs of smaller ones; the first two dorsal suckers are larger than the ventral ones, the remaining suckers are minute and widely separated. The transformed portion is slightly more than half the arm-length; the distal part is normal, bearing about 10 transverse series of four suckers.

All the distal suckers of the arms have the distal margins of their chitinous rings each armed with a dozen long pointed teeth. On the dorsal and dorso-lateral arms, the proximal suckers have smooth rings, while on the ventro-lateral and ventral arms these suckers are armed with short teeth.

The female has the distal suckers irregularly dentate with blunt, more or less fused teeth but the proximal ones have smooth rings. The buccal membrane possesses a strongly-developed, heavily wrinkled, ventral pad.

The shell is broadest in its anterior third; it is regularly acuminate towards the posterior end, which bears a well-developed spine. The latter has a dorsal keel which extends for a short distance as a laterally-flattened high keel on the posterior part of the shell (pl. 21, figs. 138 and 139). The dorsal surface is finely tuberculate, with a well-defined median rib.

The ventral surface is rather flat with a narrow median groove and two lateral, somewhat wider, grooves. The striated zone is long and the striae wavy due to the grooves. The limbs of the inner cone are very narrow and are slightly raised. The outer cone is not sufficiently well preserved to define but it also seems to be narrow.

REMARKS: In his original description of *Sepia sinope*, Gray (1849, p. 106) synonymized this species, which was reported from China, with *S. australis*. Unfortunately the posterior end of the type-specimen (pl. 21, figs. 141 & 142) is missing, but we do not have the slightest doubt that it belongs to the latter species. The specimen from Manila, mentioned by Voss (1962, p. 3) as being *S. sinope*, belongs in fact to *S. pharaonis* (see p. 26).

Several authors (Gray, 1849, p. 110; Whitelegge, 1889, p. 282; Tate & May, 1901, p. 351; Chapman 1912, p. 24) have reported this species from Australia under the name *Sepia capensis*, but according to Robson (1924, p. 643) the Australian form is very distinct from the South African. In any case, the specimens, mentioned by Gray (1849, p. 110) from Sydney and from "Australia" belong to *S. cultrata* Hoyle (see p. 59). According to Iredale (1954, p. 70) the specimen from Torquay (Victoria) identified by Chapman (1912, p. 24) as being *Sepia capensis* is, in fact, *Decorisepia rex* Iredale.

43. *Sepia sulcata* Hoyle, 1885
(Pl. 46, fig. 275)

Sepia sulcata Hoyle, 1885, p. 192; 1885a, p. 296; 1886, p. 137, pl. XIX, figs. 1-13; Adam, 1939c, p. 41.

TYPE LOCALITY: off the Ki Islands, Arafura Sea, 5°49'15"S.-132°14'15"E., 140 fms. blue mud.

MATERIAL:

a. *Holotype*: Challenger Sta. 192, 26.ix.1874; B.M. 1889.4.24.77; 1 ♂.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♂	53	87	47	26	43	85	9.5	28
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♂	53	28	28	30	114	9.5	1.3	0.5

DESCRIPTION: The body is broadest at the mantle-opening, tapering gradually towards the acuminate posterior end; the dorsal mantle-margin projects strongly, nearly reaching the anterior level of the eyes.

The sub-equal arms are all laterally compressed and strongly keeled on the outer sides (including the dorsal ones).

The tentacular club is small with a broad swimming-membrane, extending beyond the base for about half the length of the club (pl. 46, fig. 275). The dorsal protective membrane is rather wide and separated at the base from the ventral one. The minute, sub-equal suckers seem to form six longitudinal series, but are really arranged in oblique transverse series of eight.

The left ventral arm is hectocotylized, its basal three-fourths being transformed, there being a series of about 24 small suckers on both sides; both series are separated by a convex fleshy ridge.

On the dorsal arms the suckers are biserial, but on the other arms it is difficult to decide if they are biserial or quadriserial; this may be due to contraction on preservation.

Unfortunately, the shell is badly damaged and its posterior portion lacking. It is broadly oval, acuminate at both ends, especially at the posterior one. The dorsal surface shows three flat, rounded ribs, separated by wide grooves.

The chitinous margins seem to be wide, but this may be due to a decalcification. In his original description, Hoyle (1886, p. 138) mentions "a faint linear ridge in the middle line posteriorly, about 3 mm. long, and terminating 2 mm. from the base of the spine". The latter was present, but, as it had been broken off, it could not be described.

The ventral surface is flat with three wide, shallow, grooves over the whole length; these are separated by two broad, low ribs. The striated area shows the striae to be regularly convex in its posterior portion and wavy in the anterior part. It is flanked by two narrow, smooth, marginal zones. The limbs of the inner cone are narrow, raised as a thin ledge towards the posterior end (which is lacking).

REMARKS: According to Hoyle (1886, p. 139) "*Sepia elegans*, d'Orb., has the keel but no spine, while an unnamed specimen from the Cape in the Copenhagen Museum has a stronger keel reaching quite up to the spine, which is larger and thinner than in this specimen". In fact, the shell of *Sepia sulcata* closely resembles that of *S. australis* Quoy & Gaimard, 1832, but the animal of the latter species has quadriserial arm-suckers and the hectocotylus and the tentacular club are quite different.

44. *Sepia omani* sp. nov.

(Pl. 22, figs. 143-147; pl. 41, figs. 242-244)

Holotype: John Murray Exp. Sta. 75, 25°10'48"N., 56°47'30"E. to 25°09'48"N., 56°47'30"E., Gulf of Oman, 201 m, 28.xi.1933; 1 ♂ (M.L.d. = 62 mm); B.M. 1963107W.

Paratypes: Idem: 7 ♂, 6 ♀; B.M. 1963108-114W.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Sex	M. L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
♂	62	81	—	26	40	81	8	32
♂	64	70	—	36	44	—	—	41
♂	57	88	—	30	47	—	16	40
♂	59	—	—	22	38	—	—	32
♀	66	76	—	27	41	—	10.5	33
♀	66	80	53	24	41	—	7.5	33
♀	54	80	50	35	46	—	—	28

Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
♂	62	32	35	37	89	13	1.3	2.4
♂	64	39	39	41	125	15.5	1.25	3.6
♂	57	37	35	39	130	17.5	1.4	3.5
♂	59	30	30	32	100	13	1.0	2.4
♂	66	29	30	36	98	15	1.35	3.0
♂	66	30	29	35	114	13.5	1.35	3.0
♀	54	28	30	35	102	15	1.1	2.4

SHELLS (IN % OF SHELL-LENGTH)

Sex	L. in mm	W.	Th.	Str.z.	Spine	Observations
♂	62	26	10.5	53	6.5	Holotype, pl. 22, figs. 143-145
♂	64	25	9.5	50	7.8	animal distorted
♂	63	25	10.5	51	7.1	M.L.d. = 64 mm
♂	59	27	10.0	52	8.5	M.L.d. = 54 mm
♂	57	28	12.0	54	5.3	M.L.d. = 57 mm
♂	57	26	9.5	47	8.8	animal distorted
♂	54	26	9.5	50	7.4	animal distorted
♂	69	25	10	51	5.8	M.L.d. = 66 mm
♀	66	26	11	49	6.1	M.L.d. = 66 mm

DESCRIPTION: The body is rather broad, the dorsal mantle-margin projects forward strongly even beyond the mid-level of the eyes; the ventral margin is slightly emarginate. The fins start a few millimetres behind the mantle-margin. At the posterior end they extend beyond the mantle but remain separate.

All the arms are laterally compressed, the dorsal ones are rounded on the outer sides, the lateral ones are keeled on the ventral margins of the outer sides and the ventral ones have strong swimming-membranes. The web is very high between the dorsal arms and between the dorsal and dorso-lateral ones, reaching a level of about one-third to one-half the arm-length. The suckers are rather globular and are quadriserial throughout the whole length of the arms. On the proximal part of the arms the lateral suckers are smaller than the median ones, at the distal tips the lateral ones are biggest, except on the ventral arms. Their chitinous rings are smooth.

The tentacular stem is rounded in section and the club is short and broad. The well developed swimming-membrane is situated on the dorsal side and slightly exceeds the club in length. The sucker-bearing surface is mostly separated from the stem by a deep groove between the dorsal protective membrane and the tentacle itself (pl. 41, figs. 242-244). The protective membranes are not very wide; they are separated at the base of the club and do not continue down the stem. The tentacular suckers are arranged in very oblique transverse series of eight, the third sucker of the second to fourth or fifth series being larger than the other ones. The chitinous rings of the small distal suckers are finely dentate.

The buccal membrane of the female has the ventral patch expanded ventrally.

The left ventral arm of the male is hectocotylized; it has two groups of four suckers at the base, followed by a transformed portion (of about two-fifths of the arm length (9 mm)) which is slightly wider, with transverse ridges and nine or ten transverse rows of minute suckers; the two ventral series are close together and the dorsal ones are more widely spaced. The distal part of this arm has normal-sized suckers.

The shell is elongate and acuminate at both ends (pl. 22, figs. 143-147). The dorsal surface is rugose, being more strongly so in its anterior part and near the lateral margins of the posterior part and shows three ribs separated by two grooves. The ventral surface is thickest at the anterior end of

the striated area which is convex with a narrow median groove; in the anterior portion of the last loculus this groove is wider. The striae are wavy, being nearly straight in the middle, but convex in the lateral parts. There is a very narrow smooth zone on both sides between the striated area and the outer cone. The inner cone has very narrow limbs which are situated on the margins of the striated area or on the smooth zones. Along the posterior half of the striated area these limbs are raised as narrow rounded ridges which form a V-shaped posterior ledge, surrounding an excavation. From this part radiate irregular calcareous ribs into the wings of the chitinous outer cone. The latter is very narrow but forms two posterior wings which surround the inner cone.¹

The straight or slightly curved spine is directed upwards; it is laterally compressed and possesses a distinct dorsal keel and a still more pronounced ventral keel.

REMARKS AND RELATIONSHIP: The animal of this species resembles that of *S. prashadi* very closely, especially as regards the tentacular club which shows only minor differences. The big suckers of the third longitudinal series attain a much greater size in *S. prashadi* as far as the material from the Gulf of Oman is concerned (pl. 41, fig. 245), but specimens from the Gulf of Suez show them of about the same size as in *S. omani*. In the latter species the distal suckers are more numerous. The hectocotylus is of the same type but is relatively longer in *S. prashadi*. The shell of these species is completely different.

The posterior part of the inner cone with its radiating, calcareous ribs extending over the chitinous outer cone is exactly of the same type as in *S. arabica* (pl. 23, figs. 152–155), but the latter has no spine, only a dorsal keel on the posterior part of the dorsal surface.

The shell of *S. omani* resembles that of *S. kobiensis* in its general shape, but it is relatively broader. *S. kobiensis* has the mid-dorsal rib less developed and it is not flanked by deep grooves; the sculpture is more delicate and exhibits longitudinal lines of tubercles that are absent in *S. omani*. The outline of the striae of the ventral surface is different, the inner cone is rather similar, but *S. kobiensis* lacks the radiating calcareous ridges. The outer cone has a cup-shaped posterior portion which is calcareous in *S. kobiensis*, but it is chitinous and expanded in *S. omani*. The spine is not keeled in *S. kobiensis*.

S. braggi shows the calcareous ridges radiating from the inner cone, but they are less pronounced. The limbs of the inner cone are situated more at the base of the outer cone in *S. omani*, whereas in *S. braggi* and *S. kobiensis* they occupy a higher position at the margins of the striated area.

The inner cone has the same structure and general form as in *S. murrayi*, but in this species the posterior ledge is slightly more raised and sharp-edged.

45. *Sepia elegans* de Blainville, 1827 (Pl. 23, figs. 148–151)

Sepia elegans Blainville, 1827, p. 284; Férussac & d'Orbigny, 1835–1848, p. 280, pl. 8, figs. 1–5, pl. 27, figs. 3–6; Adam, 1952, p. 22, figs. 7 & 8, pl. III, figs. 1 & 2; 1960, p. 466; 1962, p. 13.

Rhombosipion elegans, Rochebrune, 1884, p. 87; Adam, 1944, p. 223.

Sepia (*Parasepia*) *elegans*, Naef, 1923, p. 560, figs. 315–320.

Parasepia (*Sepia*) *elegans*, Robson, 1926, p. 163; 1931, p. 278.

Sepia rupellaria Férussac & d'Orbigny, 1835–1848, p. 274, pl. 3, figs. 10–13.

Rhombosipion rupellarium, Rochebrune, 1884, p. 83, pl. III, fig. 3; Adam, 1944, p. 222.

? *Sepia biserialis* Blainville, 1827, p. 284.

Sepia biserialis Vérany, 1851, p. 73, pl. 26, figs. f–k.

Sepia italica Risso, 1854, p. 13, pl. V, figs. 1 & 2.

¹ In the photographs (pl. 22, figs. 143 and 144) the posterior wings of the outer cone appear shrunken because of the drying-up of the shell.

TYPE LOCALITIES: Sicily (*S. elegans*); Mediterranean (*S. bisserialis* and *S. italica*); Island of Nîmes and La Rochelle (*S. rupellaria*).

GEOGRAPHICAL DISTRIBUTION: Eastern Atlantic coasts, from the South of England to 16°36'S.; Mediterranean.

DESCRIPTION: We have not made a special study of the material in the collections of the British Museum, but we wish to give a brief description of this species, based on that of Adam (1952, p. 22) who reported it for the first time from the Southern Atlantic, because it may occur even further south.

It is a sub-littoral species, which has been collected in the Southern Atlantic between 80 and 430 m depth; in the Northern Atlantic it has been reported in lesser depths, up to 50 m, but it has never been found at the surface, although the shells drift as far as the beaches of the North Sea.

Adam's description was based on 26 ♂, 68 ♀ and 16 juvenile specimens. The longest male had a dorsal mantle-length of 72 mm and the largest female, 89 mm; females of a dorsal mantle-length of 59 mm are sexually mature. There is no noteworthy difference in the relative measurements of the two sexes.

The mantle is elongate oval, more than twice as long as wide and the dorsal margin projects forward strongly in a sharp angle; the ventral margin is slightly emarginate.

The sub-equal arms are short, being less than half the mantle-length. All the arms are laterally compressed and keeled on the outer sides. In the female the dorsal and lateral arms have about five pairs of suckers at the base of each arm and the ventral ones have two to four pairs; on the remaining parts of the arms the suckers are arranged in very oblique transverse rows of four, the median ones of which are slightly larger than the lateral ones. This arrangement is not always distinct and apparently the suckers are in three or in two longitudinal series, but the difference in size between the median and lateral suckers permits us to recognize the true arrangement. In the male, the dorsal and lateral arms each possess about 10 pairs of suckers proximally; the distal part shows the quadriserial arrangement; the right ventral arm does not differ from that of the female. The left ventral arm is hectocotylized on more than two-thirds of its length. There are a few normal suckers proximally, followed by 9 to 11 transverse rows of four minute suckers, the dorsal and the ventral suckers each forming a longitudinal zigzag series, both series being widely spaced. The distal tip of the arm has the suckers normally arranged in oblique rows of four.

The short, broadly-oval, tentacular club bears about 80 suckers, two or three of which in the middle are very big and may exceed the arm-suckers in size. On the dorsal side of these big suckers there are a few other rather large suckers. The very big suckers are probably the third ones of very oblique transverse rows of eight, but it is not possible to make out the exact arrangement.

The female possesses a single, median receptaculum seminis (spermatheca) in the ventral part of its buccal membrane.

The shell is elongate-oval and acuminate at both ends (pl. 23, figs. 148-151). In the males its width is 27.5-32.5% of the length, in the females 29.5-35%; the thickness is 8.5-11% of the length in the males and 8.5-13% in the females. The striated area is always greater than half the shell-length and may be as much as 72% of the total length of the shell. The convex dorsal surface has a distinct median rib, flanked by two shallow grooves; it is finely granulous in the calcareous portion and the chitinous lateral margins are broad. The posterior end has no spine, only a short rugose, calcareous keel. The ventral surface is faintly convex with a narrow, median groove along its whole length. The striae of the striated area are regularly convex. The inner cone has very narrow limbs, raised as rounded ridges which enclose a small depression at their posterior end. At its posterior end the rather narrow outer cone forms two distinct chitinous wings, united behind the inner cone by a small, calcareous, very rugose ledge.

REMARKS: This species rather resembles *S. australis*. The latter differs in the arrangement of the arm-suckers, in its slightly different tentacular club and hectocotylus. The shells of both species

possess a posterior keel, but *S. australis* also has a well-developed spine, a flatter ventral surface with three grooves, and a much narrower outer cone.

According to d'Orbigny (1845, p. 300), *Sepia biserialis* Blainville is a synonym of *Sepioteuthis sepioidea* Blainville but this seems to be very doubtful and most probably the former species is identical with *S. elegans* Blainville.

46. *Sepia arabica* Massy, 1916
(Pl. 23, figs. 152-155; pl. 46, fig. 278)

Sepia arabica Massy, 1916, p. 228, pl. XXIII, figs. 1-5; pl. XXIV, fig. 10.

TYPE LOCALITIES: Laccadive Sea, 11°14'30"N., 74°57'15"E., 68-148 fms.; Persian Gulf, 26°20'N., 53°54'E., 54 fms.

GEOGRAPHICAL DISTRIBUTION: Indian Ocean; Red Sea (Adam, ms.)

MATERIAL:

a. John Murray Exp. Sta. 194, 13°16'00"N., 46°20'24"E. to 13°16'36"N., 46°14'00"E., Gulf of Aden, 220m, 7.v.1934; 1 ♂. B.M. 196396W.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♂	67	89	46	19	37	—	15	28
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♂	67	30	37	34	112	9	0.3	0.6

SHELL (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Observations
a	♂	65	14.5	11.5	—	pl. 23, figs. 152-155

DESCRIPTION: The following description applies to the male which has not previously been described, the original material consisted of two female specimens.

The whole surface (in preservative) is covered with red or reddish-purple chromatophores which are crowded together on the dorsal surface of the mantle, head and arms; they are less crowded on the ventral surface giving this side a paler appearance. There are also more dense purplish patches over the eyes, distributed irregularly along the dorsal surface of the mantle and on the fins. There are 10 to 12 of these patches, roughly circular in shape, on the base of the posterior half of each fin; they recall the ornamentation which is found in *Sepiella ornata*. Just median to the row of dark patches there is, on both sides, a series of elongate warts and the spaces between the patches may be raised as pale circular tubercles.

The body is similar in general appearance to Massy's figures but our specimen is more slender and more acuminate at the posterior end.

The fins begin about 5-6 mm from the margin of the mantle and are widest near the posterior end of the body. The dorsal mantle-margin projects forward to a point between the eyes (in Massy's figure it is only slightly convex). Ventrally the margin is only slightly emarginate.

The head is somewhat narrower than the mantle opening; it is rather flattened and it has large eyes and a broad, blunt funnel. There is a web between some of the arms, this being best developed between the lateral arms; it is progressively less developed between the ventro-lateral and ventral arms, between the dorsal ones, and between the dorsal and the dorso-lateral ones. It appears to be absent between the ventral arms.

The dorsal arms are laterally compressed and rounded on the outer sides. The dorso-lateral arms are also compressed, their outer sides are bluntly rounded with rounded keels on the ventral margins. The ventro-lateral arms are much like the dorso-lateral ones but each has a thick, low swimming-membrane on the ventral margin of the outer side. The ventral arms are broadly rounded on the ventral side each with a very strong swimming-membrane on its outer margin.

All the arms being strongly compressed, their sucker-bearing surfaces are narrow with broad protective membranes. The suckers are small and widely spaced. They seem to be biserial, especially at the base, but in fact they are arranged in an oblique series of four, the outer ones often being slightly smaller than the inner ones. They appear to be arranged in alternating pairs, but are, as Massy (1916, p. 229) described, "in a slanting series of four in a row, except the proximal ones which generally consist of two and three suckers each".

The tentacles are very slender with small crescent-shaped clubs. The tentacular stem is triangular in cross-section, with blunt angles, the inner surface is flat with the protective membranes of the club continuing as low ridges. The club has a well developed swimming-membrane on its dorsal side and this is slightly longer than the club (pl. 46, fig. 278). The dorsal protective membrane is very broad and is as wide as the sucker-bearing surface. The suckers are sub-equal, arranged in about five or six longitudinal series.

The left ventral arm is hectocotylized, its sucker-bearing surface being folded together and nearly completely covered by the protective membranes. We wonder if this can be interpreted as a hectocotylization as the right ventral arm shows something of the same phenomenon.

The shell is long and narrow, rounded anteriorly and more or less pointed behind (pl. 23, figs. 152-155). The posterior portion is bent ventrally in a graceful curve. The dorsal surface has a broad, calcareous, median rib with a coarse, irregularly granulated surface. On either side of this rib, the two lateral surfaces are completely chitinized and faintly striated along their length. There is no sign of an apical spine but the posterior end of the dorsal surface bears a chitinous keel which begins at the same level as the lateral wings.

The ventral surface possesses a median groove, extending for the whole of its length and widening slightly anteriorly. At its posterior margin the last loculus is limited by the characteristic V-shaped striae described by Massy; these constitute the most distinctive feature of the shell.

It attains its greatest thickness in the posterior part of the last loculus, where the surface is strongly convex. The last loculus becomes flattened towards the anterior end. The striated area is also strongly convex except at its posterior end where it is nearly flat. This striated area is separated from the outer cone by a smooth flat zone lying between the outer cone and the branches of the inner cone. The latter has two elevated, sharply-keeled limbs extending to about half the length of the shell and separating the striated area from the flat, smooth zones.

The outer cone is narrow but slightly enlarged in its posterior part where it surrounds the inner cone. From the posterior end of the latter radiate a number of sharp-keeled ridges, calcareous in their central part and chitinous towards the margin of the outer cone, which forms two narrow wings, united posteriorly.

REMARKS: Up to the present the shell of *S. arabica* was imperfectly known as the posterior part was lacking in the original material.

This species differs from all other species in the absence of a spine, the presence of a posterior keel, its elongated form and in the calcareous ridges radiating from the posterior part of the inner cone.

47. *Sepia dollfusi* Adam, 1941
(Pl. 24, figs. 156-158; pl. 41, fig. 237)

Sepia dollfusi Adam, 1941b, p. 12, pl. II, fig. 3; 1942, pp. 3, 8; 1959, p. 138, fig. 5; pl. IV, fig. 4; pl. VI, figs. 4 & 5; pl. VII.
Sepia gibbosa Issel, 1869, p. 238 (pars) (*non* d'Orbigny).
Sepia lefebvrei, Hoyle, 1907, p. 39, figs. 1-7; ? Wülker, 1920, p. 53 (*non* d'Orbigny).
Lophosepion lefebvrei, Robson, 1927, p. 322 (pars) (*non* d'Orbigny).
Lophosepion lefebvrei, Gruvel, 1936, p. 184 (*non* d'Orbigny).
Sepia rouxi Hoyle, 1907, p. 42 (pars) (*non* Férussac & d'Orbigny).

TYPE LOCALITY: Périm.

GEOGRAPHICAL DISTRIBUTION: Red Sea; Suez Canal.

MATERIAL:

- a. Suez Canal (Fox); B.M. 1926.4.8.1. (det. Robson as *Lophosepion lefebvrei*); 1 ♂.
- b. Suez, Nov., 1904 (purchased from fisherman; W.E.H. No. 1076-1077); B.M. 1947.5.5.44-45. (det. Hoyle as *Sepia rouxi*); 2 ♂.
- c. Suez, mud flats, 2-3 fms. (W.E.H. No. 1097); B.M. 1947.5.5.46. (det. Hoyle as *Sepia lefebvrei*); 1 ♂.
- d. East of Suez (Pres. Air Commodore T. C. Morton); B.M. 1947.12.3.2; 1 ♀.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
b	♂	58	91	62	31	48	—	—	—
d	♀	55	88	49	33	49	—	—	40
a	♂	50	90	54	40	54	100	20	46
c	♂	40	90	50	30	52	—	12.5	40
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
b	♂	58	—	—	—	164	26	1.72	1.72
d	♀	55	38	42	44	136	31	1.82	2.0
a	♂	50	46	46	50	130	38	2.0	2.6
c	♂	40	45	42	47	135	32	2.0	2.0

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Observations
b	♂	58	38	18	55	
d	♀	54	40	18.5	57	
a	♂	48	42	16.5	58	pl. 24, figs. 156-158

DESCRIPTION: The male specimen, which Robson (1927, p. 322) considered to be *Lophosepion lefebvrei*, has a broad oval mantle and is dark slate-coloured on the dorsal side, except for the fins; it is yellowish-brown on the ventral side with a series of dark spots at the base of the fins. The mantle-margin is slightly convex or angular at the dorsal side and nearly straight on the ventral one. The fins extend anteriorly beyond the mantle-margin and also beyond the posterior end of the body. The head is broad with large rounded eyes. At the base of the fins there is a series of elongate tubercles. On the dorsal surface of the head there are three pairs of narrow, lighter-coloured fleshy ridges, extending from the posterior margin of the head up to about the basal half of the dorsal and

lateral arms, but not continuous with the outer keels or swimming-membranes. The ridges from the dorsal arms are nearly parallel between the eyes, being about 4 mm apart at the mid-level of the eyes; those from the dorso-lateral arms are at about 7 mm from the first ones; those from the ventro-lateral arms at about 4 mm from the second ones and situated at the dorsal margin of the pupils. The ridge coming from the ventro-lateral arms bifurcates in front of the eye, the lower branch going below the ventral margin of the pupil.

All the arms are laterally compressed and keeled on their outer sides. The protective membranes are rather narrow; the suckers are quadriserial with their chitinous rings irregularly and bluntly toothed at their distal margins.

The left ventral arm is hectocotylized with about five transverse rows of normal basal suckers followed by about eight rows of smaller ones, the dorsal suckers being smaller than the ventral ones; the rest of the arm is normal.

The interbrachial web is low and sub-equal except between the ventral arms, where it is absent.

The left ventro-lateral tip of the buccal membrane bears a minute sucker.

The tentacular stem is roughly triangular in cross-section being flattened on its inner surface and rounded on the outer one.

The swimming-membrane is not very broad being only slightly longer than the club. The protective membranes are narrow and separated at the base of the club; they continue down the stem as thin membranous ridges. The sub-equal suckers are arranged in oblique transverse rows of eight; in the middle of the club the suckers of the fourth longitudinal series are slightly larger (pl. 41, fig. 237). Their rings are denticulate all round with numerous small, more or less, blunt teeth.

The shell is broadly oval, rounded at both ends, without any spine or knob (pl. 24, figs. 156-158). Its dorsal surface is regularly convex with only a faint indication of a median rib and nearly the whole surface is covered with a fine reticulate granulation; the chitinous margins are very narrow. The ventral surface is keeled in the middle along nearly the whole length of the striated zone, except in its flat posterior part. The rounded keel has a very narrow groove in the middle. On both sides of the median keel the striated zone is concave and on both sides the striated zone is separated from the outer cone by a very narrow smooth marginal area. The last loculus is convex in its posterior central part, flattening out towards the anterior and lateral margins. The inner cone reaches to about two-thirds of the length of the striated zone; its limbs are broad and completely fused to the outer cone and to the smooth margins of the striated zone and its posterior part is very slightly raised as a flat ledge. The rather broad outer cone completely surrounds the inner one and nearly everywhere has the same width.

The female specimen (*d*) has a minute sucker on some of the tips of the buccal membrane. The ventral portion of the latter is ventrally expanded.

REMARKS: In his original description of *Sepia dollfusi*, Adam (1941*b*, p. 13) was unable from Hoyle's description (1907, p. 39) of the shell to state whether this specimen belonged to *Sepia gibba* or to *Sepia dollfusi*, but pointed out that the description of the animal agreed with that of the latter species. In the same paper Hoyle (1907, p. 42) recorded four males of *Sepia rouxi* from Suez. Three of these are in the British Museum collection. One of them (Hoyle's No. 1075), is undoubtedly *Sepia rouxi* (= *Sepia pharaonis*, see p. 22), but on examination of the cuttle-bone, the other two prove to be *Sepia dollfusi*, as well as the specimen mentioned above which Hoyle (1907, p. 39) referred to as *Sepia lefebvrei*.

Adam (1941, p. 13) referred the female specimen, described by Robson (1927, p. 322) as *Lophosepion lefebvrei*, to *Sepia dollfusi*, but he supposed that the two shells (Brit. Mus. *A* and *B*) might belong to *Sepia gibba*. These views are confirmed from an examination of the material.

48. *Sepia gibba* Ehrenberg, 1831
(Pl. 25, figs. 159-161)

Sepia gibba Ehrenberg, 1831; Adam, 1941b, p. 7, pl. II, fig. 2; 1942, p. 8; 1944, p. 236; 1959, p. 137, pl. VI, figs. 1-3.

Sepia gibbosa d'Orbigny, 1845, p. 287; Férussac & d'Orbigny, 1848, p. 281; Issel, 1869, p. 238 (pars).

Lophosepion gibbosum, Rochebrune, 1884, p. 91; Adam, 1944, p. 225.

Sepia lefebvrei d'Orbigny, 1845, p. 288, pl. 13, figs. 5 & 6; Férussac & d'Orbigny, 1848, p. 282, pl. 24, figs. 1-6; ? Weindl, 1912, p. 270.

Lophosepion lefebvrei, Rochebrune, 1884, p. 90, pl. IV, fig. 2; Robson, 1927, p. 322 (pars); Adam, 1944, p. 225.

TYPE LOCALITIES: Red Sea.

GEOGRAPHICAL DISTRIBUTION: Red Sea.

MATERIAL:

a. Red Sea (McAndrew); B.M. 1869.6.14.2; 2 shells. (det. Robson as *Lophosepion lefebvrei*.)

b. Eylath (Sta. E. 60/31; Hebrew University), 4.v.1960; 1 ♂.

c. Eylath (Sta. E. 60/62, 1(2); Hebrew University), 5.ix.1960, 3 feet; 3 ♂, 3 ♀.

d. Eylath (Sta. E. 60/62, 2(2); Hebrew University), 5.ix.1960, 3 feet; 10 juv. sp. (M.L.d. = 9.5; 10; 10; 11; 12.5; 16; 18; 18.5; 23.5 and 24 mm).

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
b	♂	39	90	56	23	51	92	15.5	41
c	♂	62	87	47	24	40	92	9.5	44
	♂	34	91	59	32	48	—	—	32
	♂	27	81	55	33	48	92	15	30
	♀	47	85	54	32	46	92	13	32
	♀	36.5	85	57	30	49	93	14	33
	♀	23	89	59	35	56	93	17	35

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
b	♂	39	41	41	51	—	22	1.8	1.4
c	♂	62	44	44	42	—	26	2.1	1.8
	♂	34	32	32	35	132	23	1.5	1.5
	♂	27	30	30	33	148	26	1.8	1.8
	♀	47	32	34	34	106	27.5	1.3	1.9
	♀	36.5	33	33	36	124	27.5	1.4	1.6
	♀	23	35	35	39	130	30	1.7	1.7

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	W.P.	Str.z.	L. loc.	M.L.d. in mm
d	♂	22	45	27	13.5	45	50	24
	♀	22.5	47	—	—	—	—	23.5
	juv.	17.5	51	23	15.5	43	49	18.5
	juv.	16	53	23	15	47	47	18
	juv.	15.5	50	19.5	15.5	45	42	16
	juv.	10.7	56	17	14	47	47	11
b	♂	36.5	40	27.5	15	52	38	39
c	♂	59	35.5	26	17	—	—	62
	♂	33	39	26	15	38	50	34
	♂	26	42	24.5	15.5	37	48	27
	♀	45	40	28	19	44	44	47
	♀	35	41	27	17	37	49	36.5
	♀	22	50	28	18	39	45	23

DESCRIPTION: Both the shells in the British Museum are in rather poor condition but belong without any doubt to *Sepia gibba*.

The only known animal was described by Rochebrune (1884, p. 91) as *Lophosepion lefebvrei*. According to this description the arm-suckers are biserial and the tentacular club bears only three small suckers. Actually this specimen is in such a poor state of preservation that it is impossible to verify Rochebrune's description.

The animal described by Issel (1869, p. 238) as being "*Sepia gibbosa*" probably does not belong to this species but to *Sepia dollfusi* Adam, 1941 (see Adam, 1959, p. 142).

The earlier-mentioned specimens from Eylath, which were entrusted to Adam by Dr H. Steinitz (Hebrew University, Jerusalem) are the first animals known with certainty to belong to *S. gibba*.¹

The mantle is broadly conical in shape, widest at the opening; in the larger specimens it is more or less cylindrical in its anterior half and bluntly acuminate behind. In the youngest specimens the dorsal margin is slightly convex, becoming more and more angular and projecting in the larger specimens. The ventral margin is very slightly emarginate. The head is short and broad and the eyes large.

All the arms are more or less laterally compressed and keeled on their outer sides, the dorsal ones of the smallest specimens only in their distal halves.

The surface of mantle, head and arms is generally smooth but sometimes has small tubercles. In some specimens the head shows some very distinct, parallel, longitudinal, linear ridges of a light-greyish colour, contrasting with the dark brown or bluish-brown dorsal surface. Two pairs of these ridges are continuous with the outer keels of the dorsal and dorso-lateral arms; the third pair, situated at the margin of the dorsal eye-lid is directed towards the dorsal surface of ventro-lateral arms.

The fins are well developed, beginning nearly at the mantle-margin and extending slightly beyond it; at the posterior end of the mantle they come close together, their free margins extending beyond the end of the body.

In most specimens the arms are sub-equal in length, the ventral ones being generally slightly longer, but in the very young specimens the dorsal arms are distinctly longer. In these small specimens the suckers are biserial at the tips of the arms, especially on the dorsal ones, where they are biserial on approximately the distal halves. This latter character disappears with age and the larger animals have a quadriserial arrangement, except at the extreme tips. The protective membranes are well developed.

The largest male has rather globular suckers with relatively small openings; this is particularly pronounced in the distal suckers. The chitinous rings of the arm-suckers of this male are smooth in the smaller suckers, and irregularly incised at the distal end in the proximal ones.

The left ventral arm is hectocotylized but only slightly transformed; at the base there are seven transverse rows of four suckers, followed by seven or eight transformed rows, the two ventral suckers of each row being only slightly smaller than the normal suckers, but the two dorsal ones are very minute. This transformed portion is not specially enlarged and the suckers remain close together.

The arm-suckers of the female are flatter and not globular, with a wider opening; their chitinous rings are armed all-around with numerous, close-set, bluntly-pointed teeth.

The tentacles are long and slender, the stem is rounded on the outer side, flat on the inner one, with two membraneous ridges which are continuous with the protective membranes of the club. The latter is elongate crescent-shaped. The numerous suckers are arranged in oblique transverse rows of eight. In each row the suckers increase regularly in size up to the fourth (beginning on the

¹ Since this memoir was set up in type, the senior author received a small female of *Sepia gibba* for identification from Professor Dietrich B. E. Magnus (Darmstadt) who collected it in the harbour of Suakin (Sudan). Professor Magnus stated (*in litt.*) that he often observed this species during his nocturnal diving experiments. During the night this *Sepia* lives in a partnership with *Diadema setosa* (Leske) and seeks its prey under the protection of the big spines of these sea urchins.

dorsal side) and then diminish, the fifth sucker having the same size as the second, the sixth the same as the first, the seventh and eighth being slightly smaller; those of the third and fourth longitudinal series are widest. The chitinous rings of the tentacular suckers shows the same dentition as the arm-suckers of the female. The swimming-membrane is well developed and is as long as the club; the protective membranes are well developed but do not extend much beyond the marginal suckers, the dorsal one is largely separated from the stem by a slit between this membrane and the swimming-membrane, but it is connected with the stem by the bases of the suckers as a series of pillars with open spaces between each other.

The web is very low and barely developed. The ventral part of the buccal membrane of the female is only slightly expanded, but this may be due to the young age of the females we examined.

The shell has in all specimens the peculiar shape of this species. It is elongate oval in general outline, without any trace of a spine (pl. 25, figs. 159-161). In very young animals it is broadly rounded at the anterior end and bluntly acuminate at the posterior one; but in older specimens it becomes more and more angular at the anterior end. Its dorsal surface is nearly flat in the greater part of its length, with a faint indication of a median rib; near the posterior end the surface is more angular with flat, sloping sides. The whole dorsal surface is finely granulous, except the narrow chitinous margins, the granules being arranged along the growth lines.

The ventral surface of the youngest specimens is already characterized by the peculiar shape of the striated area. The posterior portion of the latter shows at the end a nearly circular, flat patch, followed by about four widely spaced striae, which are slightly concave in their broad middle part, but have rounded angles in their marginal portions. This whole surface is nearly flat and finely granular; it strongly resembles the striated area of *Hemisepius* (see p. 118). Following this flat posterior part the centre of the striated area is abruptly raised, being first triangular with a rounded rib which widens more and more towards the last loculus. The latter forms a very high rounded protuberance, on both sides of which the striae are strongly convex, so that the length of the lateral parts of the striated area is much longer than in the median line (the latter is given in the table of measurements).

In the anterior part, the lateral portions of the striated area, which are each as wide as the central elevated part, are flat. The last loculus is slightly convex or flat in its anterior and lateral parts, but the centre is raised and forms a rounded conical protuberance; the striae of the striated area do not reach the top of this protuberance.

In lateral view this thick median part is triangular in outline, with a nearly flat anterior side which is slightly concave towards the anterior end, whereas the posterior side is first concave and then flat.

The inner cone is well developed; its limbs are completely fused to the outer cone, but form a rounded marginal rim which is slightly raised in the rounded posterior part. The outer cone completely surrounds the inner cone, it is widest in its lateral parts. In the larger specimens the striated area is separated from the outer cone by a narrow smooth zone, the limbs of the inner cone limiting the striated area.

With the growth of the shell the central protuberance becomes relatively more and more important and swollen, so that it is much narrower at its base and nearly circular in outline in transverse section.

REMARKS: This peculiar species is very closely related to *S. dollfusi* (p. 98), the animals scarcely differing, except in the hectocotylus which seems more developed in the latter. The shells, although related, show marked differences in their proportions and in the development of the ventral surface, the protuberance being triangular in cross-section in *S. dollfusi*.

49. *Sepia elobyana* Adam, 1941
(pl. 25, figs. 162-164)

Sepia elobyana Adam, 1941, p. 121, fig. 12; pl. III, fig. 5; 1951, p. 773; 1952, p. 33, fig. 11; pl. I, fig. 5; 1960a, p. 469.

TYPE LOCALITY: Eloby Island, Gulf of Guinea.

GEOGRAPHICAL DISTRIBUTION: Gulf of Guinea; Senegal.

DESCRIPTION: This species is only known from the six specimens described by Adam that is, 1 ♂ (holotype) from the Gulf of Guinea and 4 ♂ and 1 ♀ from Senegal. It is a very small species, the largest male specimen measuring only 53 mm in dorsal mantle-length. The mantle is less than twice as long as broad, the dorsal margin projects slightly forward in a rounded angle and the ventral margin is deeply emarginate around the siphon. In well preserved specimens the dorsal surface of mantle, head and arms shows scattered tubercles and a peculiar reticulate system of ridges that are less visible in the female. The fins are broad.

The sub-equal arms measure about half the mantle-length, and are all keeled on their outer sides. Their suckers show a very characteristic structure and arrangement. The dorsal and dorso-lateral arms of the male are effiliated at their tips, each bears about 20 transverse rows of rather globular suckers with relatively small chitinous rings which are smooth in the median suckers but are armed each with about 10 sharp, distal teeth in the lateral ones. In the first 12 rows the median suckers are much bigger than the lateral ones. Towards the distal end this difference disappears, the lateral suckers become even more important than the median ones, and on the last few millimetres of the effiliated tip only the lateral suckers persist in a biserial arrangement, hidden by the wide protective membranes. The ventro-lateral arms of the male show the same arrangement of the suckers, but the median ones are only slightly larger than the lateral ones and all the suckers have their chitinous rings each armed with 10 to 15 sharp, distal teeth. The ventral arms have wide swimming-membranes and broad protective membranes. The left ventral arm is normally hectocotylized in its proximal half with about seven transverse rows of minute suckers of which two longitudinal series are close together at the ventral side, a third row is in the middle of the arm and the last one near the dorsal side at the base of the protective membrane. In fact, these suckers are arranged in alternate pairs situated on fleshy ridges. The distal part of the hectocotylus bears about 20 rows of normal suckers, the median ones being larger than the lateral ones; all these suckers are each armed with about ten sharp distal teeth. The right ventral arm shows another very peculiar transformation. The distal part of this arm does not differ from that of the left arm. At the base of the arm there are two transverse rows of normal suckers, followed by four rows of transformed suckers, the lateral ones of which are slightly smaller than the other lateral suckers. The median suckers of these four rows (and in the largest male also the lateral ones) have their chitinous rings without teeth; these rings are very wide and thick, especially on the proximal side where they are expanded and curved. In these suckers the chitinous ring covers the whole diameter of the fleshy part in which there is no trace of the papillate zone which surrounds the chitinous ring in normal suckers.

In the female, the dorsal and dorso-lateral arms are effiliated at their tips and carry minute, biserial, distal suckers; on the ventro-lateral arms the suckers are quadriserial throughout. All the suckers are each armed with about ten distal teeth, which are much smaller than in the male, and they have very tiny teeth on the proximal part of their chitinous rings.

The tentacular club measures about 30% of the mantle-length and is rather slender. In the type specimen the tentacular suckers are very unequal on the middle part of the club where they probably form oblique transverse rows of eight. The first sucker of these rows is small, the second about twice as wide and the third one is very large, being about twice as wide as the second.

These large suckers are even larger than the biggest arm-suckers. In all the other specimens the tentacular suckers are sub-equal, arranged in oblique transverse rows of eight. These suckers have their chitinous rings each armed with about eight to ten rather long, spaced, distal teeth and with about the same number of much smaller, more widely spaced, proximal teeth.

The shell has no spine, only a very weak, blunt protuberance. It is rather acuminate at the anterior end and is broadly rounded at the posterior one (pl. 25, figs. 162-164). The dorsal surface is regularly curved, without any ribs, very finely, more or less reticulate granulous. It is very flat, the last loculus hardly attaining the level of the chitinous margin. The ventral surface shows a broad, shallow groove in the striated area and a narrow furrow on the last loculus. As the wide groove shows some other faint grooves, the striae are wavy, but their general outline is convex. The striated area is separated from the outer cone by broad, smooth, marginal zones. The inner cone is completely fused to the outer cone, its posterior part surrounding a faint depression; the lateral limbs are rather wide, their bases being situated at the margins of the striated area. The outer cone is broad in its lateral parts and continuous behind the inner cone. The shell of the type is much narrower (37.5%) than the shells of the other specimens examined (σ : 44%; φ : 46%) but does not differ in any other respect.

REMARKS: This very characteristic species does not seem to be related to any other species known. We hesitated very much before considering the specimens from Eloby Island and those from Senegal as belonging to the same species, because of the completely different tentacular suckers. The relative size of the club-suckers may vary in a slight degree in a same species, as we mentioned for *S. prashadi*, but in no other species did we find such an important difference in the tentacular clubs. In the type-specimen only the left tentacle was preserved and unfortunately no other specimens are known from the type locality. The difference in the relative width of the shell may have a sub-specific importance, but if the differences in the tentacular clubs turn out to be constant characters we shall have to reconsider how to interpret the case of these two forms, which both have the very peculiar arrangement and structure of the arm-suckers, that we have never seen in any other species.

50. *Sepia bandensis* Adam, 1939
(Pl. 26, figs. 165-168; pl. 44, fig. 266)

Sepia bandensis Adam, 1939, p. 1, figs. 1-4; 1939c, p. 53, pl. III, figs. 4 & 5.

TYPE LOCALITY: Banda Neira.

GEOGRAPHICAL DISTRIBUTION: Banda Neira; Ambon; Java; Pulu Sanguisiapo, Tawi-Tawi Islands (Sulu Archipelago); Smaller Sunda Islands; Sanoer (South coast of Bali; shell only).

DESCRIPTION: The following description is based on the original material from Banda Neira. The largest male specimen has a mantle-length of 58 mm and the largest female a mantle-length of 48 mm.

The mantle is broadly rounded at its dorsal anterior margin and the ventral margin is slightly concave. The mantle width varies between 51% and 70% of the length.

The head is short and broad and the arms short, not exceeding half the mantle-length. All the arms are keeled on their outer sides and possess narrow protective membranes. The web measures up to 23% of the longest arm.

The suckers are quadriserial, their chitinous rings are each armed with about 15 long distal denticles, which are more or less fused in the male, whereas in the female the rings are armed all round with a larger number of partially fused denticles.

The left ventral arm of the male is hectocotylized. The suckers of the fifth up to the eleventh transverse rows, especially the ventral ones, are much smaller than the ordinary suckers.

The tentacular club is short, being about one fifth of the mantle-length in size. Its oval sucker-bearing surface is distinctly detached from the stem and formed mainly by the wide ventral protective membrane and by the well-developed dorsal membrane; the latter is separated from the swimming-membrane by a deep groove which reaches up to the level of the muscular bases of the median suckers. The two dorsal rows of suckers are situated on the free portion of the membrane (pl. 44, fig. 266). The well-developed swimming-membrane is somewhat longer than the club. There are five longitudinal rows of suckers, those of the median row being wider than the other ones. The protective membranes of the tentacular club are fused at its base.

The shell is broadly oval, regularly rounded at its anterior margin and slightly acuminate behind, being about twice as long as wide; it is wider in the female than in the male (pl. 26, figs. 165-168). Its dorsal surface is regularly convex, without any ribs, and it is strongly calcified with a reticulate pattern of granules.

The ventral surface is flattened and is concave in the middle, this latter character being more distinct in the female than in the male. The striated area is very long with a very faint median groove, which is barely visible. The striae are regularly rounded. The inner cone has its lateral limbs nearly completely fused with the outer cone. There is only a slightly-raised posterior rim which surrounds the posterior depression. The rather broad outer cone is continuous behind the inner cone. There is a blunt posterior knob, but no spine. The chitinous margin of the whole shell is very narrow.

REMARKS: This species is not represented in the collections of the British Museum. As Adam (1939c, p. 55) pointed out, its shell closely resembles that of *Sepia tuberculata*, the only noteworthy difference being the absence of the posterior knob in the latter species. In this respect the shell of *Sepia bandensis* is related to that of *Sepia papillata* which has a more developed posterior knob, a dorsal rib, a distinct ventral median groove which gives an angular form to the striae, and narrower limbs in the inner cone. But the animals of *Sepia tuberculata* and of *Sepia papillata* are completely different.

On the other hand the tentacular club of *Sepia bandensis* is of the same type as in *Sepia apama* and *Sepia latimanus*. Without examination of the shell, *Sepia bandensis* could be mistaken for a young *Sepia latimanus*, or *S. apama*, but its shell has not the slightest relation to that of these two species.

The differences between the shell of *Sepia bandensis* and those of *Blandosepia baxteri* and *Blandosepia bartletti* are discussed under these species (p. 106).

There is no point in discussing the relationship between species having similar shells, as long as the animals are unknown.

51. *Sepia baxteri* (Iredale, 1940)

Blandosepia baxteri Iredale, 1940, p. 442; 1954, p. 67, pl. V, figs. 12-14.

TYPE LOCALITY: Lord Howe Island.

REMARKS: The author made this new species the type of a new genus without giving diagnoses, either of the species or of the genus. He states only that the shell very closely resembles that of *Solitosepia mestus* save for the lack of the spine. The type measures 74×32 mm and the largest shell 90×37 mm. According to his opinion "it is possible that the genus may include the *mestus*-spined series, which disagrees from typical *Solitosepia* in many features".

As we state under *Sepia mestus* Gray, the shell described by Iredale (1926, p. 189, pl. XXI, figs. 4 & 5) as being this species is different from the type specimens, whereas *Solitosepia liliana* Iredale (1926, p. 189 pl. XXI, figs. 1-3) does not seem to differ at all from the types of *Sepia mestus* Gray. In our opinion, *Solitosepia liliana* is a synonym of *Sepia mestus*, which species becomes the type of *Solitosepia*. So, if "*mestus*" ought to be transferred to *Blandosepia*, as Iredale suggests, this latter genus becomes a synonym of *Solitosepia*.

On the other hand, as we pointed out on page 47, *Sepia verreauxi* Rochebrune, the type-species of *Ascarosepion* Rochebrune, is identical with *Sepia mestus* Gray, so that *Solitosepia* is merely a synonym of *Ascarosepion*.

Unfortunately, Iredale does not compare his *Blandosepia baxteri* with other species. In a later paper, Iredale (1954, p. 67, pl. V, figs. 12–14) has figured his species and given some more information on the sizes of some additional shells, *viz.*:- 28×13 , 44×21 , 59×25 , 75×34 , 77×32 , 83×37 mm.

He gives the following description:—

“The bone is elongately oval, the dorsal area finely granulose, showing faintly a dorsal rib and adjacent lines, scarcely separating areas. This is brownish pink and the outer cone which is produced is whitish, weakly calcified, and bounded by a narrow, horny margin which extends round the bone. There is no spine, but only a slight knob. The inner cone is well developed as a narrow band, reaching in front of the siphonal cavity, and enclosing a striate area. The striated area is long, and while it does not show any ventral sulcus, there is a shallow median depression with minor ridges each side. The last locus shows a faint linear median depression and the usual marginal lines. It resembles in most features, as noted above, *Solitosepia mestus*, but as well as the lack of the spine, the dorsal surface shows more definite traces of sculpture than is met with in *mestus*.”

In our opinion Iredale's species is very closely related to *Sepia bandensis* Adam, 1939, but the shell of the former is slightly acuminate in front, whereas the latter is evenly rounded. Judging from the original figures it even more closely resembles that of *Sepia papillata*.

The general outline of the shell of *Sepia bandensis* resembles still more that of *Blandosepia bartletti* Iredale, 1954 (p. 67, pl. V, figs. 15 & 16) from Misima and the Conflict group (Louisade Archipelago).

According to Iredale this is a “shell recalling *Solitosepia liliana* of New South Wales, but lacking any spine”. As we mentioned above, Iredale's *Solitosepia liliana* is in fact *Sepia mestus* Gray. The figured type of *Blandosepia bartletti* measures 73×37 mm, other specimens: 45×20 , 45×24 , 50×29 , 62×29 , 68×33 and 70×34 mm. It resembles *Blandosepia baxteri*, but no dorsal sculpture is visible. “The ventral surface has the inner cone similar, but smaller, and the long striated area shows no signs of sulcus or groove, and is more excavate throughout. The last locus shows a shallow depression medially, and is never more elevate than the margin.”

The author mentions *Sepia bandensis* Adam as a similar bone, which “seems referable to a different source of evolution”. In fact, the outline of the striae is quite different, otherwise we do not see any difference. As to the question whether *Sepia bandensis* is of a different origin there is no point in discussing it as long as the animal of *Blandosepia bartletti* is unknown.

52. *Sepia tuberculata* Lamarck, 1798

(Pl. 26, figs. 169 and 170; pl. 27, figs. 171 and 172; pl. 28, figs. 173 and 174; pl. 44, figs. 265 and 268)

Sepia tuberculata Lamarck, 1798, p. 130; 1799, p. 9, pl. I, figs. 1^{A–B}; Férussac & d'Orbigny, 1835–1848, p. 277, pl. 6 (*nec* pl. 3^{ter}, 17, figs. 13–15); ? Steenstrup, 1875, p. IV, pl. I, figs. 20 & 21; pl. II, fig. 6; Adam, 1941, p. 113, pl. III, fig. 8.

Spathidosepion tuberculatum, Rochebrune, 1884, p. 93, pl. IV, fig. 3; Adam, 1944, p. 226.

Hemisepius (?) *tuberculatus*, Smith, 1916, p. 25.

? *Sepia mamillata* (Leach ms.) Férussac & d'Orbigny, 1835–1848, p. 277, pl. IV^{bis}.

TYPE LOCALITY: ?

GEOGRAPHICAL DISTRIBUTION: South Africa.

MATERIAL:

a. ? (Purchased Damon); B.M. 1868.6.8.1; 1 ♂.

b. St. James, South Africa (Pres. Prof. Stephenson), 11.ii.1933(F.127); B.M. 1935.3.12.4; 1 ♀.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♂	47	92	66	60	53	96	15 ⁺	57
b	♀	64	92	70	47	55	102	19	53
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♂	47	60	57	57	106	23.5	2.1	3.2
b	♀	64	52	52	59	117	31	2.3	3.9

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.
b	♀	60	45	6.7 ¹	55

DESCRIPTION: The female specimen from St. James is well represented on pl. 27, figs. 171 & 172. The ventral side of the mantle shows the characteristic lateral pads with their wrinkled surface; similar pads are present on the ventral surface of the ventral arms². The dorsal and lateral arms have their tips drawn out and are armed with minute suckers. These tips are longest in the dorsal arms, they are shorter in the dorso-lateral and shortest in the ventro-lateral ones. The ventral arms are normal and have much larger suckers at their distal end. The suckers of all the arms are quadriserial. The protective membranes are wide, covering the suckers of the effilated arm-tips.

The tentacular club has a well-developed swimming-membrane, about one and a half times as long as the club; the protective membranes are fused at the base of the club, forming a single membrane which is connected with the end of the swimming-membrane (pl. 44, figs. 265 & 268). The suckers give the appearance of being arranged in five or six longitudinal series, three suckers of the third row being much larger than the other ones; in fact the suckers are arranged in very oblique transverse series of eight.

The flattened inner surface of the tentacular stem has two membraneous ridges, joining the protective membranes.

The male specimen has its left ventral arm hectocotylized: a little more than the basal half is transformed, with two series of nine small suckers on both sides, separated by a broad transversely ridged area; the distal part of this arm is normal, bearing about 15 transverse rows of suckers.

The shell of the female specimen is very flat; the ventral surface has a narrow median groove over its whole length as well as some other radiating grooves separated by low ribs, giving a wavy appearance to the striated zone; the general outline of the striae is convex. The limbs of the inner cone are narrow, raised as low rounded ridges on their whole length and largest at the posterior end (± 1.5 mm). The dorsal surface is regularly rounded without ribs.

At the posterior end there is neither spine nor knob. This shell is a little more acuminate than the one figured by Adam (1941, pl. III, fig. 8).³

¹ The thickness is measured in the median part of the shell, the lateral margins being higher.

² Professor J. H. Day kindly informed us that according to his personal observations, these curious formations function as suckers with which the animals, living in the tidal zone, adhere temporarily to the rocks, preventing them from being swept away by the waves.

³ In the explanation of this figure Adam indicated this shell as "*Sepia tuberculata* Quoy & Gaimard" from Cape of Good Hope, but in his text (p. 116) pointed out that the specimen from the Museum of Natural History in Paris bears an erroneous indication.

REMARKS: As Adam (1941, p. 116) indicated, this species has been erroneously synonymized with *S. papillata* by Férussac & d'Orbigny (1848, p. 277). Rochebrune (1884, p. 93-95) was perfectly right in separating them.

The specimen which Steenstrup (1875, p. IV) mentioned as probably belonging to *S. tuberculata* differs from this species in having the arm-tips armed with eight instead of four series of suckers. According to Hoyle (1910, p. 267) it was clear from d'Orbigny's identification that *S. papillata* is a synonym of *S. tuberculata*, but we have not the slightest doubt that the specimens which Hoyle described as being *S. tuberculata* belong in fact to *S. papillata*.

Smith (1916, p. 26) separated both species again and stated: "but it seems to me doubtful whether they even belong to the same genus, and it is possible that *S. tuberculata* may even be identical with the preceding species" (*Hemisepius typicus*). This latter hypothesis certainly cannot be maintained. Moreover, the shell figured by Smith (1916, pl. II, figs. 1 & 2) as belonging to *S. papillata*, belongs in fact to *S. simoniana*.

The animals of *S. tuberculata* and *S. papillata* are very much alike but the tentacular club differs in the enormous size of the median suckers in the latter species. The shell of *S. tuberculata* is flatter, its dorsal surface is devoid of a median rib, the striae of the ventral surface are rounded, the limbs of the inner cone are wider and the spine or posterior knob is lacking.

The shell of *S. tuberculata* most closely resembles that of *S. bandensis* (p. 105); the only difference being a slight indication of a posterior knob in the latter; however, the animals, especially as regards their tentacular clubs, are quite different.

53. *Sepia papillata* Quoy & Gaimard, 1832
(Pl. 28, figs. 175-178)

Sepia papillata Quoy & Gaimard, 1832, p. 61, pl. I, figs. 6-14; Férussac & d'Orbigny, 1848, pl. 3^{ter}, pl. 17, figs. 13-15; Tomlin, 1923, p. 40; Massy, 1925, p. 211; 1928, p. 92; Turton, 1932, p. 1; Adam, 1939c, p. 55, pl. III, fig. 6; 1941, p. 112; Voss, 1962b, p. 251.

Spathidosepion papillatum, Rochebrune, 1884, p. 94; Adam, 1944, p. 226.

Sepia tuberculata, Hoyle, 1910, p. 265, pl. IV^a, figs. 4-6 (*non* Lamarck).

TYPE LOCALITY: Cape of Good Hope.

GEOGRAPHICAL DISTRIBUTION: South Africa.

MATERIAL:

a. Port Elizabeth (Spencer); B.M. 1890.12.14.45; 1 shell.

MEASUREMENTS:

SHELL (IN % OF SHELL-LENGTH)					
Loc.	L. in mm	W.	Th.	Str.z.	Observations
	108	43.5	10	±66	pl. 28, figs. 175 & 176

DESCRIPTION: Among the many shells labelled *Sepia papillata* in the collections of the British Museum, only the above belongs to this species; the others we have referred to *S. simoniana* (see p. 109).

The shell is broadly oval; its dorsal surface has a broad median rib and two shallow grooves and is reticulate granulous, especially near the posterior end. The latter has a blunt knob under which the thickened, calcareous, lateral parts come together, separated by the chitinous posterior margin of the outer cone (pl. 28, figs. 175-178). The ventral surface has a deep median groove, on both sides of which the shell is convex; the striae have a reversed V-shaped outline. On both sides of the striated area there is a narrow smooth area. The inner cone has narrow limbs, widening only slightly in the posterior part which is fused with the outer cone, its outer half being thicker and flat, surrounding the posterior excavation. The broad outer cone completely surrounds the inner cone.

REMARKS: The shell figured by Smith (1916, pl. II, figs. 1 & 2) as *S. papillata* differs in the very broad inner cone and belongs to *S. simoniana* (see below).

As Adam (1941, p. 115) stated, the type of *S. papillata* was collected at Cape of Good Hope and not at Port Dorey as erroneously given by Rochebrune (1884, p. 95).

The animal of *S. papillata* strongly resembles that of *S. tuberculata* in the oval pads on the ventral surface of the mantle (see p. 107), and also in the tentacular club which differs in the presence of two or three enormous median suckers, attaining diameters of 10 mm and covering the whole width of the club.

According to Massy (1925, p. 212) the left ventral arm is hectocotylized. At the base are four rows of two to three normal suckers, followed by "15 rows of diminutive suckers placed 2 in a row, in zigzag order, with shallow grooves between them. The distal third of arm is normal".

The shell of *S. papillata* differs in the presence of a dorsal rib, in having a distinct posterior knob, in the angular outline of the striae and in the narrower limbs of the inner cone. It is very similar to that of *S. simoniana* (see p. 111), the latter differing in the drawn-out posterior portion of the inner cone.

The tentacular club of *S. simoniana* is completely different (pl. 42, fig. 254).

54. *Sepia simoniana* Thiele, 1921
(Pl. 29, figs. 179-182; pl. 42, fig. 254)

Sepia simoniana Thiele, 1921, p. 436, pl. LII, figs. 5-13; Odhner, 1923, p. 7; Voss, 1962b, p. 250.

Sepia natalensis Massy, 1925, p. 212, pl. XI, figs. 1-11; pl. XIV, fig. 37.

Sepia tuberculata Gray, 1849, pp. 101, 102 (*non* Lamarck, 1799).

Sepia papillata Smith, 1916, p. 22, pl. II, figs. 1 & 2 (*non* Quoy & Gaimard).

TYPE LOCALITIES: Simon's Bay (*S. simoniana*); Cape Henderson, Durban (*S. natalensis*).

GEOGRAPHICAL DISTRIBUTION: South Africa.¹

MATERIAL:

- a. Cape of Good Hope (det. Gray as *S. tuberculata*); 1 shell (imperfect; width 65 mm, with deep ventral groove and wide inner cone); B.M. 196397W.
- b. S. Africa (Ponsonby); B.M. 1890.5.20.54; 1 shell (ventral groove rather shallow).
- c. Port Elizabeth (Ponsonby); B.M. 1890.9.22.229-231; 3 shells.
- d. Port Elizabeth (Spencer); B.M. 1890.12.14.39-41; 3 shells (one of these is doubtful).
- e. 18 miles E. of Cape Agulhas, 35 fms., muddy bottom, 21.vii.1948 (Univ. Cape Town, Ecol. Surv., TRA 27 C); 5 ♀♀. B.M. 196398W.
- f. Grahamstown, Natal; B.M. 1952.ii.24.3-4; 2 shells.
- g. Isipingo (Falcon); B.M. 1952.12.30.73; 1 shell.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
e	♀	180	83	53	42	41	94	11	47
	♀	165	90	58	51	39	97	—	—
	♀	162	87	59	44	41	99	12	40
	♀	140	84	56	49	41	±93	±8.5	39

¹ According to Barnard (*in litt.*) the S. African Museum has a ♀ specimen taken off the Tugela River, Natal, in 63-73 fms.

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>e</i>	♀	180	44	50	47	122	49	1.8	0.55
	♀	165	—	—	—	—	—	—	—
	♀	162	40	43	43	99	56	2.15	0.6
	♀	140	43	46	43	—	—	2.15	—

SHELLS (IN % OF SHELL-LENGTH)

Loc.	L. in mm	W.	Th.	Str.z.	Observations
<i>d</i>	137	44	11.5	±59	
<i>b</i>	131	38	9	±64	
<i>g</i>	121	43	10	±65	
<i>f</i>	120	45	12.5	±71	
<i>f</i>	114	49	12.5	±70	
<i>c</i>	112	44	10	±62	
<i>d</i>	111	48	14.5	—	pl. 29, figs. 181 & 182
<i>d</i>	107	47	12	±70	
<i>c</i>	105	41	11	±62	
<i>c</i>	90	43	13	63	

DESCRIPTION: The female specimens (*e*) have the dorsal mantle-margin bluntly angular in shape anteriorly. The fins extend beyond the mantle-margin and come close together at the posterior end.

The web attains about half the arm-length and is sub-equal between the dorsal, dorso-lateral, ventro-lateral and ventral arms, it is absent between the ventral arms. The big globular arm-suckers are quadriserial with smooth chitinous rings.

The tentacular club is very long; the swimming-membrane has the same length as the club and the protective membranes extend slightly on the stem beyond the sucker-bearing surface (pl. 42, fig. 254).

The sub-equal tentacular suckers are arranged in about 24 longitudinal series; their chitinous rings are armed with about 20-25 teeth, the distal ones are spaced, being long and sharp.

One of these specimens shows about six long tubercles at the base of the fins.

All the shells, except the one measuring 111 mm (*d*), agree perfectly with the original descriptions. Their general shape is broadly oval being rounded at both ends. The dorsal surface has a wide, low, median rib, limited by two narrow grooves. Nearly the whole surface is reticulate calcareous, except the rather wide chitinous margins. There is a blunt knob at the posterior end where the thick, lateral, calcareous zones come together.

The ventral surface is generally rather thick, with a more or less developed median groove over its whole length. On both sides of this groove the striated zone is more or less convex with an irregular number of very faint radiating grooves, which cause the striae to be slightly wavy; the general outline of the striae is reversed V-shaped, especially in the anterior portion. On both sides of the striated area there is generally a more or less narrow smooth zone.

The inner cone is very large and completely fused to the outer cone; its posterior portion is drawn out and nearly reaches the posterior margin of the large outer cone.

The dubious specimen (*d*), measuring 111 mm in length, differs from all the other ones by its greater thickness, in the barely indicated median groove and in the less developed inner cone (pl. 29, figs. 181 & 182).

The left ventral arm of the male, as described by Thiele (1921, p. 438) is hectocotylized in its proximal half, the second longitudinal series of suckers almost lacking, both the ventral series being smaller than the normal suckers.

REMARKS: The only noteworthy difference between the shells of *Sepia papillata* and *S. simoniana* is the enormous development of the inner cone in the latter. The animals differ principally in the completely different tentacular club.

55. *Sepia* sp.

(Pl. 30, figs. 183 & 184; pl. 46, fig. 276)

MATERIAL:

a. John Murray Exp. Sta. 27, 11°57'12"N., 50°35'00"E. to 11°56'42"N., 50°39'12"E., near Cape Guardafui, 37 m, 12.x.1933; 1 young specimen. B.M. 196399W.

b. John Murray Exp. Sta. 106, 5°38'54"S., 39°15'42"E. to 5°40'18"S., 39°17'36"E., Zanzibar area, 212 m, 12.i.1934; 1 young specimen. B.M. 1963100W.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	—	23.5	98	64	34	51	—	—	30
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	—	23.5	26	28	30	98	15	—	—

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Observations
a	—	23	54	8.7	61	pl. 30, figs. 183 & 184
b	—	19	58	—	63	

DESCRIPTION: The mantle is broadly oval, with the dorsal margin slightly convex and the ventral one distinctly emarginate. The head shows a few big cirri above each eye. The arms are short, laterally compressed and keeled on the outer sides. The web is high between the dorsal, dorso-lateral and ventro-lateral arms, reaching about two-fifths of the arm length; it is less developed between the ventro-lateral and ventral arms and non-existent between the ventral ones. The suckers are quadri-serial.

The tentacular club has a well-developed swimming-membrane exceeding the length of the club for about half its length (pl. 46, fig. 276). The dorsal protective membrane is wide at the base. The minute suckers are numerous and are arranged in at least 12 longitudinal series.

The shell is broadly oval, rounded at both ends, with a very faint indication of a flat median rib on its dorsal surface; the whole surface being slightly reticulate granulous (pl. 30, figs. 183 & 184). The ventral surface is very flat with a faint, narrow, median groove. The striae of the striated area are slightly convex, flanked by two broad, smooth, marginal zones. The inner cone has narrow, slightly raised, limbs, situated approximately in the middle of each smooth zone; the posterior part forms a narrow, rounded ridge, surrounded by the narrow posterior part of the broad outer cone. The spine is very short; it is damaged.

REMARKS: These specimens seem to be closely related to *Sepia simoniana* (= *S. natalensis*), but as we have never seen young specimens of the latter, it would be hazardous to consider them conspecific until more material is known. There are small differences—the tentacular club seems to be less elongate, the shell flatter, the inner cone less developed, but these may be juvenile characters.

56. *Sepia myrsus* Gray, 1849
(Pl. 30, figs. 185 & 186)

Sepia myrsus Gray, 1849, p. 108.

TYPE LOCALITY: China (?).

GEOGRAPHICAL DISTRIBUTION: ?

MATERIAL:

a. China?; B.M. 1841.4.6.89; 1 shell (holotype).

MEASUREMENTS:

SHELL (IN % OF SHELL-LENGTH)

Loc.	L. in mm	W.	Th.	Str.z.	Observations
a	72	44	11.8	58	pl. 30, figs. 185 & 186

DESCRIPTION: This shell has clearly suffered a deformation during its growth. Otherwise we cannot find any difference between this species and *Sepia simoniana*, but as the animal of the former is unknown and if the locality "China" is exact, it is impossible to take a decision about regarding these two species as identical.

57. *Sepia hieronis* (Robson, 1924)
(Pl. 30, figs. 187 & 188; pl. 43, fig. 262)

Sepia sp.A. Robson, 1924, p. 13.

Rhombosipion hieronis Robson, 1924a, p. 645, pl. II, figs. 9-11; Massy, 1927, p. 158.

Sepia hieronis, Voss, 1962b, p. 251.

TYPE LOCALITIES: Cape Town, S. Africa: Sta. 8 (126 fms.), Sta. 7 (112 fms.), Sta. 33 (150 fms.), Sta. 2 (117 fms.), (according to Barnard, *in litt.*, these localities are in the Saldanha Bay-St. Helena Bay area and not off Cape Town).

GEOGRAPHICAL DISTRIBUTION: South Africa.

MATERIAL:

- a. Cape Town, Sta. 7, 112 fms.; B.M. 1924.9.9.54-5: syntypes; 1 ♂ (without shell), 1 ♀ (with shell), 1 shell (probably from Sta. 2) (Robson, p. 645, mentions 2 ♀♀ for Sta. 7) (according to Barnard, *in litt.*, the exact locality is in the Saldanha Bay-St. Helena Bay area: 32°32'S., 17°42'E.).
- b. Cape Town, Sta. 2, 117 fms.; B.M. 1924.9.9.56: syntypes; 1 ♀ (distorted), 1 shell (according to Barnard, *in litt.*, the exact locality is in the Saldanha Bay-St. Helena Bay area: 33°3'S., 17°42'E.).
- ?c. Natal; B.M. 1924.9.9.72-3; 1 shell. (det. Robson as "*S. acuminata*, juv. No. 109; see p. 53).
- d. Lion's Head S.E.7 S, 50 miles, shrimp trawl, 230 fms., gn.s. (P.F.15057, No. 1306; det. Massy); B.M. 1926.10.20.5; 1 juv. (M.L.d. = 8 mm).
- e. Lion's Head S.E.7 S, 50 miles, shrimp trawl, 230 fms., gn.s. (1261, No. 24; det. Massy); B.M. 1926.10.20.12-13; 2 juv. (M.L.d. = 12 and 19 mm).
- f. Univ. Cape Town Ecol. Surv., Afr. 716.H, 9.vi.1947; 1 ♀ (distorted; M.L.d. = 58 mm). B.M. 1963101W.
- g. S. African Coast, 30°09'S., 19°02'E., 144 fms., 10.ix.1947, Afr. 761E (Pres. J. H. Day); B.M. 1958.8.20.7; 1 ♀.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
<i>g</i>	♀	61	74	54	38	51	85	8	38
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>g</i>	♀	61	38	38	38	—	10	1.64	0.49

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	Observations
<i>a</i>	—	60	42	11.7	65	pl. 30, figs. 187 & 188
<i>c</i>	—	56	39	9.8	70	
<i>a</i>	♀	49	44	12.2	59	
<i>b</i>	—	42	48	12.4	57	

DESCRIPTION: Most of the specimens are hardened in alcohol and cannot be measured properly.

The only male specimen (*a*) has the proximal half of all its arms with normal suckers in transverse rows of four, the median suckers being slightly wider than the lateral ones. The dorsal arms have their distal parts normal, the suckers diminishing gradually in size. The dorso-lateral arms have three pairs of enormously enlarged suckers at the base of the distal halves. They attain diameters of 2 mm, whereas the normal suckers are only half as wide. The ventro-lateral arms possess three or four pairs of slightly enlarged suckers at the base of the distal third, the biggest one measuring about 1.6 mm in diameter. The right ventral arm has much smaller suckers on its middle third, followed by five pairs of bigger suckers, measuring up to 0.9 mm. All the arm-suckers have smooth rings. The left ventral arm is hectocotylized, with one normal sucker at its base. The proximal half of this arm is transformed with very small, widely-spaced suckers; the ventral ones are mostly lacking. This transformed portion is transversely striated, without any longitudinal ridge of the kind found in *S. acuminata*. The distal half has biserially arranged suckers, the first six pairs of which are much bigger than the others.

The tentacular club has about five rows of minute suckers but is not well enough preserved to be described in detail.

One female specimen (*g*) is in rather good condition. It has the ventral part of the buccal membrane very strongly developed and reflected towards the ventral side.

The dorsal and dorso-lateral arms show a peculiar transformation. On the dorsal ones all the suckers are arranged in two longitudinal series. On the dorso-lateral ones they are irregularly arranged on the basal part of the arm, due to contraction, but in fact they are biserial; in the middle part there are four pairs of enlarged globular suckers, each attaining a diameter of about 1.4 mm, whereas on the distal third of the arm they become abruptly much smaller and quadriserial. On the ventro-lateral and ventral arms the suckers are also biserial on the basal two-thirds, but due to contraction on fixation this arrangement is obscured and they seem to be placed in three series. The tips of all the arms, except the dorsal ones, seem to have the quadriserial arrangement of the suckers, but we are not sure that this is not due to contraction and that, in fact, all the suckers are biserial.

The tentacular club bears five or six rows of minute suckers (pl. 43, fig. 262). The dorsal protective membrane is very broad without any suckers. The swimming-membrane is well developed and extends down the tentacular stem for a distance nearly half the club-length.

The female syntype (*a*) has no enlarged suckers on its dorso-lateral arms. In the female (*f*) the enlarged suckers are well developed on the lateral arms, especially on the dorso-lateral ones, and even, to a lesser degree, on the ventral arms.

The shell differs only slightly from that of *Sepia acuminata*. Its ventral surface is a little more elevated. The striated zone has a distinct median groove and is limited by two marginal, slightly concave areas; the limbs of the inner cone are situated at the base of the outer cone. There is no terminal spine, only a blunt knob. A broad portion of the outer cone surrounds the inner one (pl. 30, figs. 187 & 188).

REMARKS: In some respects the shell resembles that of *Sepia savignyi*, but the latter shell is less rhomboidal, the marginal areas of the striated zone are completely smooth and much wider, the limbs of the inner cone broader and their free ridge flattened; moreover it has a short spine.

58. *Sepia insignis* Smith, 1916
(Pl. 31, figs. 189-191)

Sepia insignis Smith, 1916, p. 25, pl. II, fig. 10; Tomlin, 1923, p. 41.

TYPE LOCALITY: Tongaat Beach, Natal.

GEOGRAPHICAL DISTRIBUTION: Natal.

MATERIAL:

a. Tongaat Beach, Natal (Burnup); B.M. 1920.3.23.5; 1 shell (figured holotype)

MEASUREMENTS:

SHELL (IN % OF SHELL-LENGTH)					
Loc.	L. in mm	W.	Th.	Str.z.	Observations
<i>a</i>	26	33	16.5	65	pl. 31, figs. 189-191

DESCRIPTION: The shell is acutely angular in its anterior portion and broadly oval in its posterior half. Its dorsal surface is curved along its entire length, bluntly keeled in the middle, pink coloured (especially in the central and posterior part) and very faintly rugose. The ventral surface is flat with a broad, shallow, median groove in the striated zone, lined by two blunt ribs. The striae become more and more angular towards the last loculus, which is faintly convex. The inner cone shows nearly the same width throughout its whole length; its limbs, which extend almost along the entire length of the striated zone, and its posterior portion are narrow and flattened, only the extreme posterior part, which surrounds a very shallow depression, is slightly raised. The outer cone is broad, surrounding the inner cone. There is no indication of a spine.

REMARKS: This species, the animal of which is unknown, does not seem to be related to any other species hitherto described.

59. *Sepia (Metasepia) pfefferi* Hoyle, 1885
(Pl. 43, fig. 256)

Sepia (Metasepia) pfefferi Hoyle, 1885, p. 199; 1885*a*, p. 304; 1886, p. 145, pl. XXI, figs. 1-10; Brazier, 1892, p. 13.
Metasepia pfefferi, Iredale, 1954, p. 78.

? *Metasepia pfefferi laxior* Iredale, 1926*a*, p. 240, pl. XXXV, figs. 9 & 10; 1954, p. 78.

? *Metasepia pfefferi wanda* Iredale, 1954, p. 78, pl. V, figs. 9-11.

TYPE LOCALITY: Challenger Sta. 188, 9°59'S., 139°42'E., South of Papua, Arafura Sea, 28 fms., gn.m.

MATERIAL:

a. Holotype (Challenger Sta. 188), 10.ix.1874; B.M. 1890.1.24.11; 1 ♀.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
a	♀	52	94	—	48	63	96	11.5	38
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
a	♀	52	52	58	58	115	11.5	2.3	3.3

SHELL (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z
a	♀	42	55	16	71

DESCRIPTION: The mantle is broadly oval, its dorsal margin being slightly angular and the ventral margin a little emarginate. The ventral surface shows a V-shaped ridge, situated at about 12 mm distance from the base of the fins, the surface at the outer side of this ridge being covered with small papillae.

The dorsal arms are distorted, the remaining ones are provided with keel-like swimming-membranes. The suckers are quadriserial, short-stalked and more or less imbedded in the arm-surface. Their chitinous rings are finely toothed in the distal half, each surrounded by a narrow papillate area and a wider, radially grooved, outer area, which is emarginate on the distal side.

The tentacular club is short with its swimming-membrane nearly twice as long (pl. 43, fig. 256). The dorsal protective membrane is separated from the stem by a deep groove; at the base of the club it remains separated from the ventral membrane. The tentacular suckers are very few in number; they seem to be arranged in about five longitudinal series but this is difficult to make out because of the enormous size of three or four median suckers, which are much larger than shown in the original figure.

The shell is rhomboidal, much shorter than the mantle, which extends beyond the posterior end of the shell. It is bluntly acuminate at both ends and more or less angular at the lateral margins. The dorsal surface is completely chitinized and has no median rib; it is faintly convex in the middle, flatter towards the margins and has radiating longitudinal lines.

The ventral surface is rather thick in the anterior third, with a deep median furrow in the anterior part of the striated area, both halves of the latter being strongly convex anteriorly, flatter in their posterior part, and with irregular radiating smaller grooves which give a wavy aspect to the striae whose general outline is reversed V-shaped. The last loculus is very short. The inner cone forms a narrow, rounded ridge, gradually diminishing towards the posterior end. The outer cone is narrow, surrounding the inner cone. There is no posterior depression. According to the original description (Hoyle 1886, p. 146) "a number of radiating calcareous streaks pass outwards into the horny termination" from the rounded angle of the inner cone.

REMARKS: According to Hoyle (1886, p. 147) the fact that the chitinous portion of the shell of *Sepia pfefferi* is visible over the whole of its dorsal surface "separates it clearly from all *Sepiae* or related forms, with two exceptions, *Sepia tuberculata* Lamarck, and *Hemisepius typicus* Steenstrup". In fact, the latter species has a chitinous dorsal surface, but in the former it is normally calcified; probably Hoyle has seen a decalcified specimen.

Iredale (1926a p. 240, pl. XXXV, figs. 9 & 10) described a new sub-species *laxior*, based on three shells from Masthead, which differ from the type in being relatively broader, measuring: 51×32 (W. = 63%), 36×24 (W. = 67%) and 27×16 (W. = 59%). According to Iredale "in the largest specimen there is a calcification, unfortunately broken, which suggests a spine formation".

In a later publication Iredale (1954, p. 78) mentions this sub-species from other localities along the Queensland coast and states that the shell shows the presence of a spine which "is scarcely calcified, the chitinous dorsal covering being produced as seen in the figure". In fact, we are unable to detect any spine in this figure. According to Iredale "This genus is the only one yet known which shows the retention of the chitin", but he forgets *Hemisepius* which shows the same phenomenon.

He describes a new sub-species *wanda*, for specimens from Denham Bay, W. Australia, which has a long horny spine. In the figure (pl. V. figs. 9-11) the lateral margins of the shell are more rounded. The figured specimen measured 32×20 mm (W. = 62.5%). "The Western one, moreover, shows little calcification of the inner limbs, while in the eastern the inner limbs are well calcified. The ventral surface becomes more swollen with age and size, and a deep median furrow is developed. A larger specimen measured 38 mm by 23 mm, while a specimen from Stradbroke Island, South Queensland, measured 43 mm by 27 mm." From this text we cannot make out if this latter specimen belongs to the sub-species *wanda*; if this is the case it is not only a western form.

As *Sepia pfefferi* is only known from the type specimen, we do not know anything about the variation in this species and it seems pointless to us to describe every specimen which differs a little from the type specimen as a separate sub-species.

A second species of *Metasepia*, *M. tullbergi*, was described by Appellöf (1886, p. 26, pl. II, figs. 7-14) from Japan. Several authors (Ortmann, 1888, p. 656; Joubin, 1897, p. 103; Berry, 1912, p. 424; Okada, 1927, p. 179; and Sasaki, 1914, p. 621, 1929, p. 217, fig. 118, pl. XVIII, figs. 16-19) mentioned or described this species from Japanese localities.

Hoyle (1886, p. 148) enumerated the following differences between *Sepia pfefferi* and *S. tullbergi*: "In *Sepia pfefferi* the pits at the base of the funnel for articulation with the mantle are deepest in the middle, not at the anterior end as in *Sepia tullbergi*; there is no trace of any tubercles on the back or head; the teeth of the suckers on the sessile arms are finer and more acute, not so broadly triangular, as indicated in Appellöf's figure (pl. II, fig. 13); the tentacles are decidedly shorter and the large suckers on the club are not so conspicuous (compare pl. II, fig. 8, with pl. XXI, fig. 7 of the present report, where indeed they are hardly large enough); the denticulation of their horny rings, too, is much finer and not so regular. The shell agrees in almost every particular with Appellöf's description, except that the posterior extremity, although somewhat thickened, does not give rise to any structure at all like the horny lamella indicated by his figure (pl. II, fig. II, a)."

Although we did not examine any material of *S. tullbergi*, we think that the specific separation of both species of *Metasepia* is justified.

Sasaki (1929, p. 217) gave a very detailed description of *M. tullbergi*. It is worth mentioning that the male specimens do not show any hectocotylyzation of the arms. The tentacular club is much longer than in *M. pfefferi*, with the swimming-membrane extending far beyond the base of the club. The suckers are more numerous, apparently arranged in five or six series "unequal in size, four or five in the second row from the dorsal side of club being the largest of all, and three or four in the third row come next in size". The largest suckers are much smaller than in *M. pfefferi*.

As to the shell, its general form resembles that of *M. pfefferi* but "in the posterior extremity it forms on the dorsal surface a small, keel-like, vertical plate projecting dorsally and posteriorly".

60. *Sepia (Hemisepius) typica* (Steenstrup, 1875)
(Pl. 32, figs. 192–195; pl. 33, figs. 196 & 197)

Hemisepius typicus Steenstrup, 1875, p. 469, pl. I, figs. 1–10, pl. II, fig. 1; Hoyle, 1912, p. 281; Chun, 1915, p. 412, figs. 33 & 34; Smith, 1916, p. 25; Massy, 1927, p. 164; Voss, 1962b, p. 252.

Hemisepiion typicum, Rochebrune, 1884, p. 78, pl. 3, fig. 1.

Hemisepius typicus var. *chuni* Thore, 1945, p. 50.

TYPE LOCALITIES: Table Bay; St. Francis Bay (var. *chuni*).

GEOGRAPHICAL DISTRIBUTION: South Africa.

MATERIAL:

- a. Cape Natal, W. by N. $6\frac{1}{2}$ miles (Pres. S. African Museum, No. 1262); B.M. 1926.10.20.7; 1 ♂ (in poor condition; det Massy as *Rhombosepiion* sp. A. juv.).
- b. Hout Bay (Pres. S. African Museum, P.F. 2273, No. 2273), shrimp trawl, 9–20 fms., sand and brackish shingle; B.M. 1926.10.20.29; 1 ♂ (det. Massy).
- c. False Bay, Roman Rock, NW. $\frac{3}{4}$ N. $\frac{3}{4}$ miles (Pres. S. African Museum, P.F. 3046, No. 1259), large dredge, 18 fms., sand and rough shingle; B.M. 1926.10.20.28; 1 ♂ (det. Massy).
- d. Langebaan Lagoon, Sta. XIV, 8 ft., L.B. 76, 15.vii.1946 (Pres. J. H. Day); B.M. 1958.8.20.21–30; 12 ♂, 3 ♀.
- e. False Bay, $34^{\circ}07'S.$, $18^{\circ}31'E.$, $27\frac{1}{2}$ miles, F.B. 1001, 22.ii.1947 (Pres. J. H. Day); B.M. 1958.8.20.10; 1 ♂ (M.L.d. = 19.5 mm).
- f. Saldahana Bay, S.B. 79, 14.vii.1946 (Pres. J. H. Day); B.M. 1963.10.2W.; 2 ♂ (M.L.d. = 21 mm).
- g. False Bay, $34^{\circ}09'S.$, $18^{\circ}28'E.$, 23 miles, F.B. 1004, 29.iv.1948 (Pres. J. H. Day); B.M. 1958.8.20.13–18; 6 ♂, 1 ♀.

DESCRIPTION: As it is practically impossible to measure exactly the different parts of these tiny animals without damaging them, we give only a general description of the best preserved ones.

The male specimen (b) from Hout Bay has a dorsal mantle-length of 19 mm. Its dorsal mantle margin is slightly angular and the ventral one is strongly emarginate. The dorsal surface of the animal is slightly rugose, especially on the head and on the base of the arms. The rather wide fins, are fused at the posterior end of the body. The ventral surface of the mantle shows, on each side, an elongate, oval, slightly granular patch with 11 or 12 pores in its anterior half. The series of pores are situated at a distance from the fin base equal to the width of the fin.

The sub-equal arms are laterally compressed, with outer keels. The web is high, reaching about half-way up the arms, except between the ventral ones. All the arms have rather large, globular, biserial suckers. The dorsal arms bear 11 pairs of large suckers and a few small suckers at the tip; the large suckers are broadest at the base of the arm, diminishing towards the distal end, but the ninth and tenth pair are again slightly broader. The dorso-lateral arms show the same arrangement, but here the eighth and ninth pair are broader. On the ventro-lateral arms there are 13 to 15 pairs of large suckers, the eleventh and twelfth pair of which have the greatest diameter.

The right ventral arm has about 15 pairs of large suckers, the basal ones of which are much broader than on the other arms; they also diminish in size towards the distal end and the eleventh to the fourteenth pair are again larger.

The left ventral arm is hectocotylized: its basal two-thirds bear ten pairs of minute, widely-separated suckers, the intermediate space between the two series being transversely ridged. The distal third of this arm has five or six pairs of much larger suckers and a few minute suckers at the tip.

The tentacular club is short, crescent-shaped, with a high swimming-membrane, extending down the stem for about half the club-length. The dorsal protective membrane is wide and is separated from

the ventral one at the base of the club. The minute, sub-equal suckers are arranged in four or five longitudinal series.

The male (*c*) from False Bay has a dorsal mantle-length of 21 mm. The dorsal surface of the mantle is covered with small, widely-spaced tubercles. The ventral surface bears 12 pores on the left side, 13 on the right one, each pore being situated in the middle of a distinct roundish patch.

The hectocotylus has 12 pairs of minute suckers on its transformed part, the twelfth pair being slightly larger and followed by five pairs of normal big suckers and a few pairs of minute suckers at the tip.

Among the male specimens (*d*) from Langebaan Lagoon, one with a mantle-length of 20 mm has been illustrated on pl. 32, figs. 192 & 193.

The hectocotylus of a male with a mantle-length of 19.5 mm measures 11 mm (pl. 33, fig. 196) whereas the corresponding right arm has a length of 9.5 mm (pl. 33, fig. 197).

The female specimens are slightly longer, their dorsal mantle-length attaining 23.5–24 mm (pl. 32, figs. 194 & 195). The ventral part of the buccal membrane is very strongly developed as an expanded, strongly papillate patch with very high, crowded papillae.

All the arms have their suckers biserial; these gradually diminish in size from the base to the tip.

All the females have also the characteristic ventral pores, 12 or 13 on each side of the ventral side of the mantle.

The shell of the figured specimen (M.L.d. = 24 mm) has a length of 21 mm and a width of 12 mm. It is very acuminate at the anterior end, broadly rounded at the posterior end and nearly completely chitinized, the dorsal surface being without any trace of calcareous covering. The ventral face is difficult to describe, the anterior 8.5 mm is a thin, triangular, chitinous membrane, behind which begins the area which may be compared to the loculi of other *Sepiidae*, but which differs greatly.

The whole of this formation is reversed conical in outline, the anterior margin being slightly concave and the lateral margins convex. There are about 20 parallel striae; the last loculus, which is only a transverse band, is finely granulous. Behind the striae there is a thin, circular spot, which seems to represent the central part of an inner cone. The latter has short, rather broad, rounded limbs, which are completely fused with the very broad outer cone, this being continuous behind the inner cone as a broad, thin margin.

REMARKS: In his original description, Steenstrup (1875, pl. I, figs. 3–5) figured the dorsal and ventral faces of the shell of this species, but did not give a lateral view.

Rochebrune (1884, pp. 78, 79, pl. III, fig. 1), who has mentioned the species without having seen it, gives a lateral view of the shell which seems to be a pure invention. In fact, it shows a thick shell with the last loculus extending up to the anterior end of the shell; this figure is completely erroneous.

Thore (1945, p. 50) has mentioned and described some specimens from Table Bay and Oude Kraal. He thinks that "we have to postulate a constant difference in size between the eastern and the western forms of *Hemisepius*, the latter being largest".

It seems to us very hazardous to make such a statement on the few specimens known or described up to the present; in fact only one specimen from the eastern region (St. Francis Bay) was described by Chun (1915, p. 411). In our opinion it is not at all "obvious that, at least, we have to do with two different varieties of *Hemisepius typicus*", as Thore (1945, p. 52) thinks. Chun's figure 34 of the hectocotylus is rather schematic and it is not unlikely that some of the big suckers at the basal part of the distal portion were lost. Until more specimens are known, we do not see that a case has been made for creating a "var. *chuni*" for the animals from the eastern area.

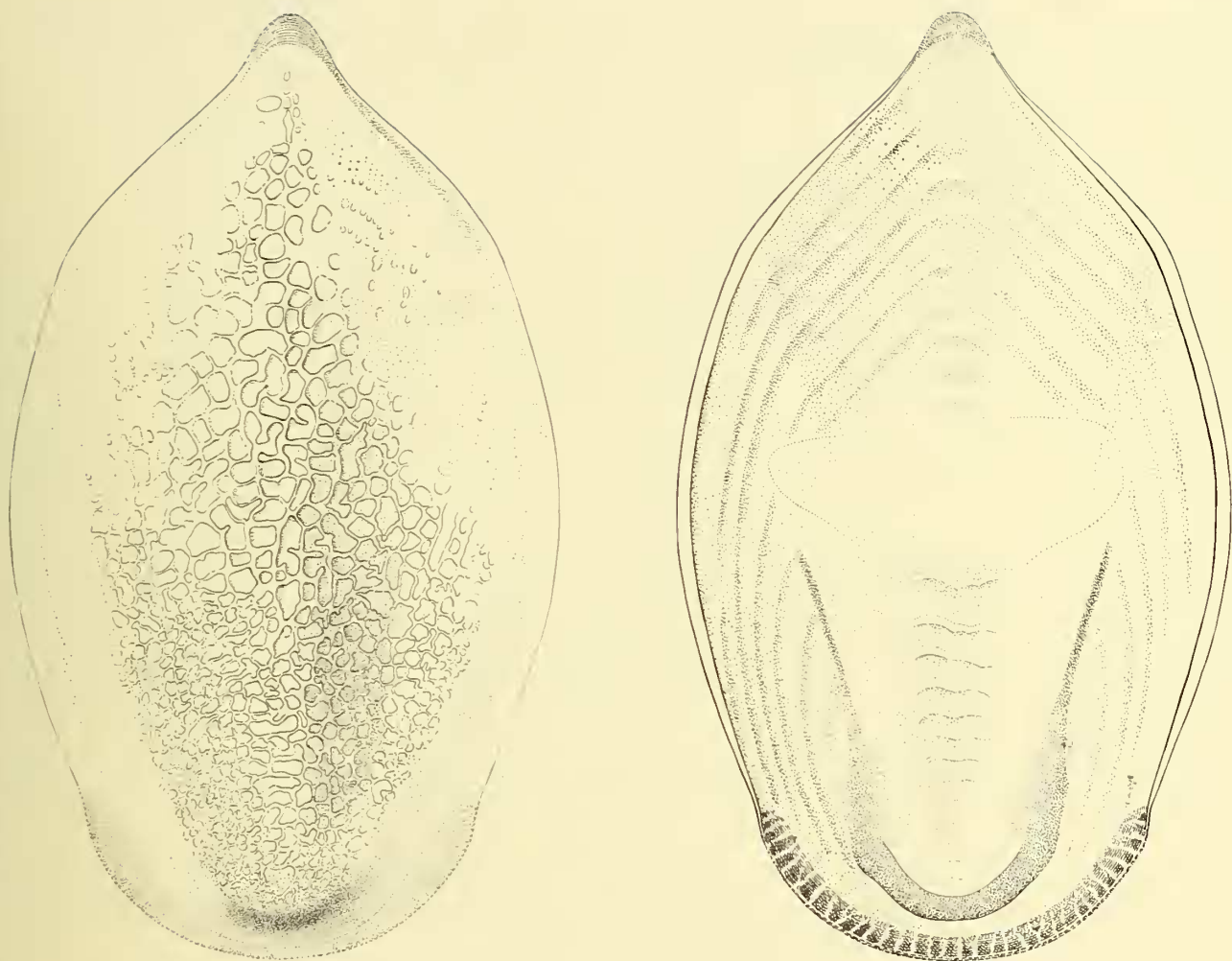


FIG. 1. *Sepia (Hemisepius) dubia* sp. nov.: dorsal and ventral views of shell ($L=14.5$ mm).

61. *Sepia (Hemisepius) dubia* sp. nov.
(Pl. 34, figs. 198–201; pl. 46, fig. 272; text-fig. 1)

TYPE LOCALITY: False Bay.

MATERIAL:

- a. False Bay (Univ. Cape Town Ecol. Surv.), F.B. 1007, 18.iii.1950; B.M. 1963103W.; 1 ♀ (holotype).

DESCRIPTION: The animal is small (dorsal mantle-length, 17 mm; ventral, 15 mm) and broad (width: 11.5 mm). The dorsal surface of mantle, head and arms is covered with well spaced, round papillae, creating a very rugose appearance. The dorsal mantle-margin is slightly convex and the ventral margin is deeply emarginate around the funnel (pl. 34, figs. 200 & 201). The ventral surface of the mantle is smooth, with a thick, fleshy keel, parallel to the outer margin, as in *Hemisepius typicus*, but without any pores. On the dorsal surface of the mantle, approximately in the middle, there are two oval patches of contracted papillae, one on each side of the median line, and a third one anteriorly near the mantle-margin.

All the arms are laterally compressed, sub-equal in length, keeled on their outer sides and with narrow protective membranes. The web is very high between the dorsal and lateral arms, reaching

half way up the arms; it is much lower between the ventro-lateral and ventral arms and non-existent between these last. The arm-suckers are rather small and biserial.

The tentacular stem is triangular in cross-section; it is flattened on the inner surface and roundly angular on the outer one. The club is small, crescent-shaped, with a well-developed swimming-membrane, extending beyond the base of the club for about half its length. (Pl. 46, fig. 272). The dorsal protective membrane is wide and is separated from the ventral one at the base of the club. The minute, sub-equal suckers are arranged in four or five longitudinal series.

The shell is broadly oval, acuminate at the anterior end, but less so than in *Hemisepius typicus* and is broadly rounded behind (pl. 34, figs. 198 & 199 and text-fig. 1). It is a low dome-shape in the middle but is flatter near the margins. Nearly the whole dorsal surface is calcareous, with a reticulate pattern. There is no spine. The ventral surface is strongly concave and spoon-shaped. The central part has a reversed conical shape and is slightly higher than the surrounding part; it occupies a little more than half the shell-length, as in *Hemisepius typicus*. The last loculus is trapezoid, widest at the anterior margin. This last loculus represents about half the length of the striated area. Behind the last loculus, the striated area occupies only the central third portion of the whole inner zone, and is flanked by two broad, smooth, marginal areas. The striae, about 15 in number, are widely-spaced, transverse, nearly straight, being only slightly wavy. There is a distinct inner cone, brownish in colour in alcohol, with rather broad limbs, that are completely fused to the outer cone; its posterior part surrounds a very shallow depression. The broad outer cone surrounds completely the inner one.

The shell measures about 14.5×9 mm; unfortunately it was brittle and was slightly damaged during extraction.

REMARKS AND RELATIONSHIP: This species certainly differs from *Hemisepius typicus* in having a tuberculate skin and in the absence of ventral pores on the mantle; the tentacular clubs are exactly alike.

The shell is of the *Hemisepius* type, but differs from all the specimens of *H. typicus* that we examined, in the calcareous covering of the dorsal surface and in possessing a very distinct inner cone.

62. *Sepia robsoni* Massy, 1927
(Pl. 46, fig. 279)

Rhombosepion robsoni Massy, 1927, p. 159, pl. XVII.

TYPE LOCALITY: Hout Bay.

GEOGRAPHICAL DISTRIBUTION: South Africa.

MATERIAL:

- a. Hout Bay (P.F. 2273, No. 1282), 9–20 fms., fine sand and shingle; B.M. 1926.10.20.8; 1 ♂ (holotype).

DESCRIPTION: This tiny species has been well described by Massy. Its mantle length is only 17 mm, the specimen being an adult male. The dorsal mantle-margin is slightly convex. The ventral surface is much like that of *Hemisepius typicus* with the fleshy ridge and the same deeply emarginate mantle-margin, but there is no trace of any pores. The dorsal arms have the finger-like tips, devoid of suckers, described by Massy (1927, p. 159), and eight pairs each of sub-equal suckers, the last pair being slightly smaller. The dorso-lateral arms have eight pairs each of sub-equal suckers, the distal ones being slightly larger with narrow apertures and rings, and are followed distally by a few small suckers. The ventro-lateral arms each have nine pairs of big sub-equal suckers. The left ventral arm is hectocotylized as in *Hemisepius typicus*, with ten pairs of minute suckers, occupying the proximal

three-quarters of the arm, but are without the enlarged suckers at the base of the distal part. The right ventral arm bears seven pairs of rather large suckers, covering more than half the arm; the ventral ones are larger than the dorsal ones and are much larger than those of the other arms. All the arm-suckers are rather globular.

As in *Hemisepius typicus*, the web reaches half way up the arms between the dorsal, dorso-lateral and ventro-lateral arms; between the ventro-lateral and ventral arms it is much lower and is completely lacking between the ventral ones.

The tentacular club is exactly like that of *Hemisepius typicus*: it is crescent-shaped, about $2\frac{1}{2}$ mm long, and has a very broad swimming-membrane, extending beyond the base of the club for about half the length of the latter (pl. 46, fig. 279). The dorsal protective membrane is very broad at the base of the club. The sub-equal suckers are arranged in transverse rows of four to six, the median ones being slightly larger than the other ones.

The completely chitinized (? decalcified) shell is in poor condition. Its anterior part is strongly acuminate and resembles that of *Sepia hieronis*.

REMARKS: According to Massy (1927, p. 159) *S. robsoni* resembles *S. hieronis* (see p. 112) "but is distinguished from it by having grooved suckers (smooth rings) which are placed in 2 rows on all the arms, and none is enlarged in the male". There are a few tubercles along the outline of the shell and on the head. The shell somewhat resembles that of *S. insignis* (see p. 114) but the latter is even more acuminate anteriorly and seems to be much wider in its posterior part.

In the original description it was stated that the shell was dissolved, but we have no proof that it was ever calcified.

In our opinion this species is closely related to *Hemisepius typicus* but more material is needed to determine its exact relationship.

63. *Sepiella cyanea* Robson, 1924
(Pl. 36, figs. 208-215)

Sepiella cyanea Robson, 1924, p. 13; 1924a, p. 648, figs. 25-27, pl. II, fig. 6; Adam, 1939c, p. 109, figs. 14A-B, pl. IV, figs. 3 & 4.

? *Sepiella obtusata* Massy, 1928, p. 95 (*non* Pfeffer, 1884).

Sepia sp. a. Voss, 1962, p. 3.

TYPE LOCALITY: Natal.

GEOGRAPHICAL DISTRIBUTION: Natal.

MATERIAL:

- a. Natal (Sta. 476), 20 fms.; B.M. 1924.9.9.40; 1 ♂ (lectotype, here designated)¹.
- b. Port Elizabeth (Spencer); B.M. 1890.12.14.46-48; 3 shells.
- c. Port Elizabeth (Ponsonby); B.M. 1891.6.13.40; 1 ♀.
- d. Algoa Bay (Spencer); B.M. 1895.12.18.1; 1 ♀.
- e. Durban (Chubb); B.M. 1963104W.; 1 ♂.
- f. Isipingo (Falcon); B.M. 1952.11.21.39-40; 2 shells.
- g. Nosy N'Tangam, 30.xi.1959 (Cherbonnier); I.R. Sci. Nat. Brussels, I.G. 22.037; 5 ♂, 1 ♀, 4 juv. (♀?).

¹ The second specimen mentioned by Robson could be traced neither in the British Museum, the South African Museum nor at the headquarters of the Marine Biological Survey of South Africa.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
<i>a</i>	♂	74	74	45	23	41	93	15	41
<i>c</i>	♀	75	80	53	24	40	87	13.5	36
<i>d</i>	♀	71	84	45	27	42	95	14	38
<i>e</i>	♂	75	81	41	24	39	85	9.5	41
<i>g</i>	♂	56	88	57	25	52	100	19.5	36
	♂	55	87	56	25	49	98	18	35
	♂	53.5	86	60	26	49	98	20	36
	♂	50	86	58	26	52	98	20	38
	♂	48	86	60	27	50	92	12.5	40
	♀	69	86	52	25	49	100	19	29
	♀?	37	87	65	27	51	100	19	27
	♀?	37	87	59	27	51	100	19	27
	♀?	37	84	65	27	51	95	16	27
	♀?	29	89	64	31	55	91	12	28

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>a</i>	♂	74	41	47	61	81	19	1.35	0.35
<i>c</i>	♀	75	33	36	47	146	22.5	1.1	0.35
<i>d</i>	♀	71	39	39	48	—	22.5	—	—
<i>e</i>	♂	75	41	45	55	106	17.5	1.6	0.35
<i>g</i>	♂	56	36	46	54	—	23	2.1	0.55
	♂	55	36	44	49	—	22	2.2	0.55
	♂	53.5	36	43	50	—	20	2.1	0.55
	♂	50	38	48	54	—	24	2.0	0.5
	♂	48	40	50	56	—	21	2.1	0.45
	♀	69	29	30	38	—	24.5	1.45	0.7
	♀?	37	27	27	35	—	—	1.5	—
	♀?	37	27	27	38	—	24	1.35	0.4
	♀?	37	27	27	38	—	—	1.35	—
	♀?	29	28	31	35	—	—	1.7	—

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	L.loc.
<i>f</i>		80	32.5	12	60	34
<i>f</i>		76	31.5	12.5	58	32
<i>c</i>	♀	74	30.5	11	51	37
<i>d</i>	♀	70	31.5	12	53	39
<i>g</i>	♀	69	35.5	13	58	33
<i>a</i>	♂	69	29	10	58	29
<i>g</i>	♂	54	33	14	56	28

DESCRIPTION: The specimens in the British Museum are in rather poor condition and the following description is based principally on a series of well preserved animals, from Nosy N'Tangam, in the Royal Institute of Natural Sciences in Brussels.

The body is thick, cylindrical in its anterior half, obtusely rounded or slightly acuminate behind. The dorsal mantle-margin is angular in the middle and concave behind the eyes; the ventral margin is slightly emarginate around the stout funnel. The fins are broad, arising a few millimetres behind the mantle-margin and extending beyond the posterior end of the mantle where they are fused at their base.

The head is short and slightly wider than the mantle-opening. The whole dorsal surface (in alcohol) is of a bluish grey or brown colour with a vague indication of dark round patches at the base of the fins in the males.

The arms are short, stout at their base and laterally compressed each with a keel on the outer side. In the male the arms are relatively much longer than in the female. The web is low, sub-equal, slightly less developed between the dorsal and dorso-lateral arms and absent between the ventral arms.

The suckers are quadriserial, those of the male are each armed with a dozen strong, sharp teeth on the distal half of the chitinous ring; those of the female are practically smooth. In the female the protective membranes are more developed than in the male and cover the distal suckers.

The left ventral arm of the male is hectocotylized in its basal half where it is wide with a strong dorsal protective membrane which is folded over the dorsal suckers. The whole transformed portion (pl. 36, fig. 214) bears two dozen alternate pairs of minute suckers; the two ventral series are close together, nearly forming a single series; the dorso-lateral series are near the base of the protective membrane and the dorso-median one approximately in the middle of the transformed part. These pairs of suckers are placed on thick, fleshy ridges which anastomose with each other.

The tentacular stem is triangular in cross-section with a rounded keel on the outer side and a flat, transversely-striated, inner surface, which is limited by two membraneous ridges, these being the continuation of the protective membranes of the club. The swimming-membrane of the latter is not very broad and barely reaches the base of the club. The protective membranes are narrow. The minute, sub-equal suckers are arranged in about 12 longitudinal series in both sexes (pl. 36, fig. 215). Their chitinous rings are each armed with a few, blunt, spaced teeth.

The shell of the female is broadly rounded posteriorly and is acuminate in its anterior half (pl. 36, figs. 212 & 213). The dorsal surface is finely granular, with a broad median rib. The ventral surface shows a rather irregular, narrow and shallow median furrow and some other irregular radiating furrows, which give a wavy appearance to the convex striae.

The last loculus is flatter, with a shallow depression. The inner cone is V-shaped with narrow limbs. The outer cone is chitinous and broadly rounded behind the inner cone.

The shell of the male is much narrower than that of the female; it is widest in the middle and acuminate towards both ends (pl. 36, figs. 208 & 209). The ventral surface is much thicker and the inner cone is less developed. In both sexes the extreme posterior end of the inner cone forms a small rounded knob. The outer cone is narrower and slightly acuminate at the posterior end.

REMARKS: Unfortunately Robson did not describe the shells in detail and did not figure them. As the female syntype seems to be lost it is impossible to know more of its shell than that the latter was relatively broader (32%) than the shell of the male (29%). All the above-mentioned specimens seem to belong to *Sepiella cyanea*, as well as the shells from Ambavanibé, Madagascar, described by Adam (1939c, p. 110, fig. 14, pl. IV, figs. 3 & 4).

Sepiella cyanea seems to be closely related to *S. ornata* (Rang) from the West African coast (see Adam, 1952, p. 37, figs. 12 and 13, pl. II, figs. 3-5), but the shell of the latter (pl. 35, figs. 203-207), is distinctly different, the width being 24-27% of shell-length in the males and 27-30.5% in the females, whereas the striated area is shorter. The general outline of the shell of *S. ornata* is more elongate oval and not so broad in the posterior part.

Compared with the shell of *Sepiella weberi* Adam, 1939 (pl. 37, fig. 216-219), the posterior part of the striated area is much more acuminate in *S. cyanea*, especially in the male.

64. *Sepiella inermis* (Férussac & d'Orbigny, 1835-1848)
(Pl. 38, figs. 222-227; pl. 40, figs. 233 & 234)

Sepia inermis Férussac & d'Orbigny, 1835, pl. 6bis; 1848, p. 286, pl. 20, figs. 1-9.

- Sepia* (*Sepiella*) *inermis*, Tryon, 1879, p. 196, pl. 91, fig. 423, pl. 92, figs. 424-429; Steenstrup, 1880, pp. 347, 356, figs. 1-8.
Sepiella inermis, Rochebrune, 1884, p. 88; Goodrich, 1896, p. 5; Joubin, 1898, p. 25; Hoyle, 1905, p. 982, fig. 152; Massy, 1916, p. 231, pl. XXIII; Winckworth, 1926, p. 330; Adam, 1939*b*, p. 65; 1939*c*, pp. 93, 104, figs. 1-5, pl. IV, figs. 5 & 6; Satyamurti, 1956, p. 178, pl. XXVI, fig. 2*a-b*.
Sepia (*Sepiella*) *microcheirus* Gray, 1849, p. 107.
Sepiella microcheirus, Adam, 1939*c*, p. 105.
Sepiella curta Pfeffer, 1884, p. 13, figs. 16, 16*a*; Wülker, 1910, p. 20; Adam, 1939*c*, p. 106.
Sepiella maindroni Rochebrune, 1884, p. 89; Adam, 1939*c*, p. 106; 1944, p. 224.
Diphtherosepion martini Rochebrune, 1884, p. 81; Adam, 1944, p. 221.
Sepia tourannensis Eydoux & Souleyet, 1852, p. 33, pl. 3, figs. 6-12; Adam, 1939*c*, p. 107.
Rhombosépion touranense, Rochebrune, 1884, p. 84; Adam, 1944, p. 222.
Sepia affinis Eydoux & Souleyet, 1852, p. 35, pl. 3, figs. 13 & 14 (*non* Férussac, 1826).
Sepiella affinis, Adam, 1939*c*, p. 107.

TYPE LOCALITIES: Batavia; Bombay; Pondicheri; Coromandel Coast (*S. inermis*); India (*S. microcheirus*); Java (*S. curta*); Pondicheri (*S. maindroni*); Sumatra (*S. martini*); Touranne Bay (*S. tourannensis*); Touranne Bay (*S. affinis*).

GEOGRAPHICAL DISTRIBUTION: Indian Ocean.

MATERIAL:

Animals:

- a. India (General Hardwicke); 1 ♀ (det. Gray, 1849 as *Sepia microcheirus*), B.M. 1963121W.
- b. India(?) (Mr Leadbeater); 1 ♂ (det. Gray, 1849 as *Sepia microcheirus*), B.M. 1963122W.
- c. Bental (General Hardwicke); 1 ♀ (det. Gray, 1849 as *Sepia microcheirus*), B.M. 1963123W.
- d. India (General Hardwicke); 1 ♀ (det. Gray, 1849 as *Sepia microcheirus*), B.M. 1963124W.
- e. Penang (Cantor Coll., East India Museum); B.M. 1860.6.2.86 (part), re-registered 1947.11.4.2; 1 ♂ (M.L.d. = 44 mm).
- f. Sumatra (Coll. Carl Bock); B.M. 1879.10.4.1-2; 2 ♀.
- g. Ramesvaram Island, Madras (Thurston); B.M. 1894.9.6.2-4; 1 ♂, 1 ♀.
- h. Sandheads, R. Hooghly, Bengal; 5.iv.1927 (Pres. Director, Indian Museum); B.M. 1947.5.16.9; 1 sp. (identified as *S. ? aculeata*).
- i. Aden, Feb., 1949 (Coll. Fraser-Brunner); B.M. 1963105W.; 1 ♀.
- j. Mukalla, S. Arabia, Dec., 1948 (Coll. Fraser-Brunner); B.M. 1963106W.; ♀.

Dry shells:

- k. India (General Hardwicke); 3 shells (det. Gray, 1849 as *Sepia microcheirus*), B.M. 1963125W.
- l. Sarawak (Coll. Bartlett) (Santubang and Buntal); B.M. 1894.7.14.7-9; 3 shells.
- m. Sarawak (Coll. Bartlett) (Santubang and Buntal); B.M. 1894.7.14.47-48; 2 shells.
- n. Madras, 12.i.1936 (Winckworth); B.M. 1948.7.9.8-17; 10 shells.
- o. Gopalpur, May, 1929; B.M. 1952.11.21.28-29; 2 shells.
- p. Ennûr, 10.ii.1925; B.M. 1952.11.24.9-11; 3 shells (♀).
- q. Puri, 22.iv.1929; B.M. 1952.11.24.12-15; 4 shells.
- r. Ennûr, 10.ii.1925; B.M. 1952.11.24.16-19; 4 shells.
- s. Connanore, 1.xii.1924; B.M. 1952.11.24.20; 1 shell.
- t. Madras beach, 15.i.1927 and 23.x.1927 (largest specimen); B.M. 1952.11.24.21-23; 3 shells.
- u. Madras, 18.ix.1930; B.M. 1952.11.24.75-76; 1 juv. shell (removed from box with *Sepia winckworthi*).
- v. Gopalpur, Gonjam, 25.v.1929; B.M. 1952.12.30.39-47; 9 shells.
- w. Tellicherry, 1.x.1930; B.M. 1952.12.30.48-51; 4 shells.
- x. Madras, 12.i.1936; B.M. 1952.12.30.52-55; 4 shells.
- y. Juhu, 11.xi.1935; B.M. 1952.12.30.58; 1 shell.
- z. Madras, 12.i.1936; B.M. 1952.12.30.59-64; 6 shells.

MEASUREMENTS:

ANIMAL (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
<i>i</i>	♀	93	92	48	27	43	100	16	32
Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>i</i>	♀	93	34	37	45	130	30	1.5	0.55

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	L.loc.	Observations
<i>i</i>	♀	90	37	15	50	33	pl. 38, figs. 225 & 226
<i>f</i>	♀	69	39	12	55	30	pl. 40, fig. 233; pl. 38, fig. 222.
<i>f</i>	♂	68	38	13	56	31	
<i>r</i>	♂	39	40	15.5	41	49	
<i>r</i>	♂	48	40	13.5	54	31	
<i>q</i>		86	38	13	60	27	
<i>w</i>		84	36	13.5	50	39	
<i>s</i>		84	36	13	59	29	
<i>p</i>		78	41	15	51	33	pl. 38, figs. 223 & 224
<i>w</i>		75	37	13	59	32	
<i>n</i>		75	39	12.5	56	33	
<i>x</i>		74	41	13.5	58	30	
<i>w</i>		73	36	12	56	34	
<i>x</i>		70	43	14	57	31	
<i>v</i>		69	42	13	48	39	
<i>v</i>		69	42	13	56	35	
<i>o</i>		67	39	13.5	51	39	
<i>v</i>		66	42	13	58	41	
<i>x</i>		65	40	15.5	49	42	
<i>p</i>		65	43	15.5	43	43	
<i>n</i>		65	42	16	49	40	
<i>x</i>		63	42	14	54	35	
<i>v</i>		60	40	14	48	50	
<i>o</i>		59	42	16	48	44	
<i>n</i>		59	42	14.5	51	39	
<i>q</i>		58	40	14.5	65	21	
<i>w</i>		56	36	13	59	30	
<i>q</i>		55	37	14	64	24	
<i>q</i>		54	39	15	67	26	
<i>v</i>		52	40	14.5	48	40	
<i>v</i>		51	36	14	47	41	
<i>p</i>		51	35	14	65	29	
<i>n</i>		50	42	15	46	42	
<i>z</i>		50	36	16	56	34	
<i>n</i>		49	39	14	59	31	
<i>z</i>		47	41	15.5	51	36	
<i>n</i>		46	35	16	48	39	
<i>z</i>		43	38	16	44	44	
<i>y</i>		42	37	15.5	50	40	
<i>n</i>		39	40	15.5	44	46	
<i>z</i>		36	39	15.5	42	50	
<i>t</i>		35	41	14	43	49	
<i>r</i>		33	42	15	42	48	
9							

Loc.	Sex	L. in mm	W.	Th.	Str.z.	L.loc.	Observations
<i>n</i>		32	41	16	44	47	
<i>t</i>		32	42	16.5	44	50	
<i>n</i>		31	43	17	45	48	
<i>r</i>		30	42	15.5	43	50	
<i>z</i>		29	40	16	45	52	
<i>t</i>		29	40	16	41	48	
<i>j</i>		28.5	39	16	39	47	
<i>n</i>		26	42	17	39	50	
<i>z</i>		26	44	19	—	—	

DESCRIPTION: With the exception of the big female specimen from Aden (*i*), the animals are in more or less poor condition and do not allow a detailed description.

This specimen from Aden is the longest ever recorded of *Sepiella inermis*.

The body is broadly oval, the dorsal mantle-margin is angularly rounded and the ventral margin is slightly emarginate (pl. 38, fig. 227).

The short, stout arms are laterally compressed and the dorsal ones are indistinctly keeled; the others have outer keels which are particularly developed on the ventral arms. The protective membranes are well developed. The suckers are quadriserial.

The sub-equal web is rather low and is absent between the ventral arms.

The swimming-membrane of the tentacular club is slightly shorter than the club-length. The narrow protective membranes are separated at the base and continue as low membraneous ridges on the flattened inner surface of the stem, whose outer surface is rounded. The minute, sub-equal suckers are arranged in 24 series in the middle part of the club (pl. 40, fig. 234).

The shell of this animal is broadly oval; its ventral surface is strongly convex in lateral view. Its dorsal surface is granulous with a distinct but low median rib. The ventral surface is thick in the middle, with a narrow, median groove and several, faint, radiating furrows on the striated area (pl. 38, figs. 225–226). The anterior portion of the last loculus is concave. The general outline of the striae is strongly convex, but they have a wavy outline due to the radiating grooves. The inner cone forms a thick, narrow, rounded posterior ridge; its lateral limbs are wider but flatter and indistinct. The outer cone forms a semi-circular wing-like posterior portion.

As to the other specimens and to the dry shells, the young shells show the striated area to be much narrower than the last loculus, which continues down both sides to the inner cone. In these young shells the striated area is concave in its general appearance, with the narrow groove in the middle of the convex central portion.

The inner cone of the female shell forms a narrow, thick, rounded, posterior ridge, raised in the centre as a rounded knob. In most specimens the limbs of the inner cone turn abruptly outwards at some distance from the posterior end, become first broader and thicker and then progressively flatter and fuse with the outer cone on to the smooth narrow zones which separate the striated area from the outer cone. In some shells (pl. 38, fig. 224) the inner cone widens immediately, becoming fused to the outer cone; the striae of the striated area continue on these expanded limbs. In the narrower shells of the males these formations of the inner cone are less distinct.

The left ventral arm of the male is hectocotylized in its proximal half, with ten transverse rows of minute suckers.

REMARKS: On the first examination of the big specimen from Aden we thought it might be a new species but after a thorough comparison with *Sepiella inermis* there remained only one difference—the high number of minute suckers on the tentacular club. Adam (1939c, p. 96) described the number of suckers in an oblique transverse row as 13 to 14 in the females, 16 in the males, but according to Massy (1916, p. 234) “The very numerous and minute club suckers are distributed in no particular order”.

The females from Sumatra (*f*) possess 20 to 24 suckers in the transverse rows in the middle of the club.

As the shells are completely alike and the number of club-suckers seems to vary a good deal, we have finally included this specimen in *Sepiella inermis*.

It is worth mentioning that Adam (manuscript in preparation) found a young *Sepiella* among the collections from the Hebrew University of Jerusalem, made in the southern part of the Red Sea. This specimen does not seem to differ from *S. inermis*.

As to the different species enumerated as synonymous, Steenstrup (1880, p. 356) stated that *Sepiella microcheirus* Gray represented the female of *S. inermis*. Among the original material of *S. microcheirus* are two males and two females, but both belong without any doubt to *S. inermis*.

After having examined the types of *S. curta* Pfeffer, Adam (1939c, p. 106) considered this species to be synonymous with *S. inermis*.

Adam (1939c, p. 106) first thought *S. maindroni* Rochebrune, 1884, to be a male specimen of *S. inermis*, but the type-specimen proved to be a female of that species (Adam, 1944, p. 224). As we mention on p. 130, the other references concerning *S. maindroni*, from Japanese localities, probably refer to *S. japonica*.

The type specimen of *Diphtherosepion martini* Rochebrune, 1884, is a male of *S. inermis* (Adam, 1944, p. 221).

Sepia tourannensis and *S. affinis* Eydoux & Souleyet, 1852, which Rochebrune (1884, p. 84) had already considered to be identical and which he placed in his genus *Rhombosepion*, belong without any doubt to *S. inermis* (Adam, 1944, p. 222).

As for *Sepiella mekwardi* Iredale, 1954, the only species hitherto described from Australian waters (Condon Bay, Melville Island, Northern Territory), its shell strongly resembles that of *S. inermis*, but in both sexes it is relatively narrower: that of the type female measuring $53 \times 18 \times 6.6$ mm (W. = 34%; Th. = 12%), that of the male $44 \times 14 \times 6$ mm (W. = 32%, Th. = 13.5%). According to the author (p. 79) the male shells show a notch in the posterior fan, those of the females lack such a notch. We wonder if this notch is really characteristic or if the posterior part of the outer cone had simply split on drying.

The species was based only on stranded shells. Iredale (1954, p. 79) mentions a single animal (dredged in 40 fms. S.E. of Lesueur Island, Australia) the bone of which was decalcified, but which probably belongs to *Sepiella mekwardi*. As he did not describe this animal we are unable to decide how nearly related this species is to *S. inermis*. Iredale himself did not compare his species with other species of *Sepiella*, he only mentions that "Adam has reviewed the named species, amalgamating some forms irrespective of geographical distribution and then naming a new species, *S. weberi* from the Moluccas"¹. But he does not try to refute Adam's arguments, unless he considers geographical distribution to be a specific character. On the other hand Adam's conclusions (1939c, p. 114) with which we completely agree, result in a nearly complete geographical separation of the species he recognized (see his map of this distribution, fig. 17, p. 115), viz.:—

Sepiella ornata (Rang): West Africa, from Mauritania to Angola;

Sepiella cyanea Robson: South East Africa;

Sepiella inermis (Férussac & d'Orbigny): Indian Ocean from the Red Sea to Indonesia and Cochin China;

Sepiella japonica Sasaki: Chinese and Japanese waters;

Sepiella ocellata Pfeffer is only known from a single male specimen from Java. Its shell (pl. 35, fig. 202) strongly resembles that of *S. ornata* but it is still narrower. The tentacular club has only 8 to 10 longitudinal series of minute, sub-equal suckers.

¹ Adam (1939c, p. 98) described this species from Timor and Soemba which do not belong to the Moluccas but to the Lesser Soenda Islands.

Sepiella weberi Adam, from Timor and Soemba (pl. 37, figs. 216–219), strongly resembles *S. cyanea* but the posterior portion of the striated area is much more acuminate in the latter species. The tentacular club has, in both sexes, 10 to 12 longitudinal series of minute, sub-equal suckers.

As Adam (1939c, p. 101) pointed out, Rochebrune (1884) classified *S. inermis* and its synonyms in three different genera, viz.:—*Diptherosepion*, *Sepiella* and *Rhombosepion*.

65. *Sepiella japonica* Sasaki, 1929
(Pl. 39, figs. 228–231)

Sepiella japonica Sasaki, 1929, p. 219, fig. 170,¹ pl. XVIII, figs. 20–23, pl. XIX, fig. 28; Yasumoto, 1938, p. 45, figs. 1 & 2; Adam, 1939c, p. 110, fig. 15A.

? *Sepiella ovata* Pfeffer, 1884, p. 14, figs. 18 & 18a; Adam, 1939c, p. 112, fig. 16B.²

? *Sepiella obtusata* Pfeffer, 1884, p. 15, figs. 19 & 19a; Adam, 1939c, p. 113, fig. 15B.

? *Diptherosepion dabryi* (pars) Rochebrune, 1884, p. 81; Adam, 1944, p. 221.

? *Sepia sinensis* Férussac & d'Orbigny, 1835, pl. IX, figs. 1 & 2; 1848, p. 289; d'Orbigny, 1845, p. 299.

? *Sepia* (*Sepiella*) *sinensis*, Gray, 1849, p. 106.

? *Sepiella sinensis*, Berry, 1912, p. 417; Sasaki, 1914, p. 623; Adam, 1939c, p. 114.

Sepiella maindroni, Hoyle, 1886, p. 149, pl. XXII, figs. 1–10; Wülker, 1910, p. 20; Berry, 1912, p. 424; Sasaki, 1914, p. 621, fig. 1; Ishikawa, 1924, p. 195 (non Rochebrune, 1884).

Sepiella inermis, Joubin, 1897, p. 103; Berry, 1912, p. 424; Sasaki, 1914, p. 622 (non Férussac & d'Orbigny, 1835).

? *Sepia recurvirostra*, Hoyle, 1886, p. 137 (non Steenstrup, 1875).

Sepia sp. c Voss, 1962, p. 3.

TYPE LOCALITY: Etchû Province, Japan.

GEOGRAPHICAL DISTRIBUTION: Chinese and Japanese seas.

MATERIAL:

- a. Canton market (Pres. Tradescant Lay); 2 salted specimens. (det. Gray, 1849, p. 107, as *Sepia* (*Sepiella*) *sinensis*.) B.M. 1963127W.
- b. China (Pres. Card); 1 ♀. (det. Gray, 1849, p. 107 as *Sepia* (*Sepiella*) *sinensis*.) B.M. 1963128W.
- c. Chefu, China (purchased Swinhoe); B.M. 1873.9.22.1; 1 ♀.
- d. Chee-foo, China (purchased Swinhoe); B.M. 1874.1.24.9; 1 ♂.
- e. Challenger Exp. Sta. 207, 12°21'N., 122°15'E., China Sea³, 16.i.1875, 700 fms.; B.M. 1889.4.24.76; 1 broken shell. (det. Hoyle as *Sepia recurvirostra*?)
- f. Challenger Exp., Inland Sea, Japan; B.M. 1890.1.24.12; 1 ♀. (det. Hoyle as *Sepiella maindroni*?)
- g. Inland Sea, Japan (Pres. Gordon Smith); B.M. 1904.10.28.1–2; 2 ♀.

MEASUREMENTS:

ANIMALS (IN % OF DORSAL MANTLE-LENGTH)

Loc.	Sex	M.L.d. in mm	M.L.v.	M.W.	H.L.	H.W.	F.L.	F.W.	A.L. I
b	♀	89	83	49	33	39	84	11	22
g	♀	114	87	44	26	33	94	15	40
	♀	140	86	41	21	36	89	13.5	30

¹ This figure is indicated as "*Sepiella heylei* n.n."

² In this paper the figure was erroneously referred to as 16A in the indications between brackets under 12. *Sepiella ovata* (p. 112).

³ According to Hoyle (1886, p. 137) the locality is: "off Tablas Island".

Loc.	Sex	M.L.d. in mm	A.L. II	A.L. III	A.L. IV	T.L.	T.cl.	S.a.	S.t.
<i>b</i>	♀	89	25	27	29	118	27	—	—
<i>g</i>	♀	114	40	40	44	—	—	1·15	0·35
	♀	140	30	30	35	—	—	1·0	—

SHELLS (IN % OF SHELL-LENGTH)

Loc.	Sex	L. in mm	W.	Th.	Str.z.	L.loc.	Observations
<i>b</i>	♀	86	28·5	14	49	42	
<i>c</i>	♀	99	27·5	13	54	35	
<i>d</i>	♀	126	31	12	52	36	pl. 39, figs. 228 & 229
<i>f</i>	♀	120	29	13	57	32	
<i>g</i>	♀	138	30·5	12·5	52	36	pl. 39, figs. 230 & 231

DESCRIPTION: The animals are in rather poor condition, the most recent ones in the collection having been collected nearly 60 years ago, although it seems to be one of the most common species in Japan.

The dorsal mantle-margin is angular and projects forward strongly. All the arms are laterally compressed and keeled on their outer sides. The suckers are quadriserial, those of the male being each armed with 15 to 20 long, close-set teeth on the distal margin of the chitinous ring. The web is highest between the dorsal and lateral arms. The tentacular club is long and covered with about 20 longitudinal series of minute suckers.

The left ventral arm of the male is hectocotylized, its basal part is transformed, bearing a dozen transverse rows of minute suckers, placed on a grooved surface. Of the four longitudinal series of these suckers, the two ventral ones are close together, the third row is in the middle and the fourth situated between the latter and the dorsal margin. The transformed portion measures only one-third to one quarter of the arm-length.

The shells (pl. 39, figs. 228–231) do not reveal any sexual difference. The finely granulous dorsal surface is rather convex with an indistinct median rib. The ventral surface is convex except at the posterior end of the striated area and at the flattened anterior portion of the last loculus which is concave in the middle. The striae are convex in general outline, but irregularly wavy due to the faint radiating grooves, the median one of which may be more pronounced. The inner cone is V-shaped with very narrow limbs and a rounded posterior knob. The outer cone is long and broad in its posterior portion extending far beyond the inner cone and is regularly rounded behind.

REMARKS: The specimens described above agree very well with Sasaki's detailed description (1929, p. 219). Apparently there is a difference in the dentition of the arm-suckers, but we are sure that there is a printing error in the original text. After having described the suckers of the males as being dentate, the author states: "In mature males the teeth are united together so as to render the ring smooth on the whole margin." In fact this applies to mature females, because Sasaki (pl. XVIII, fig. 20), figures the strongly dentate sucker of a mature male.

Although several earlier authors have used the name *sinensis* for this species, we have adopted Sasaki's name *Sepiella japonica* in order to avoid any possible confusion.

As Adam (1939c, p. 113) indicated, *Sepiella ovata* Pfeffer, 1884, from an unknown locality, is probably identical with *S. japonica*, but the poor state of the type did not allow a definite conclusion. The same is true of *Sepiella obtusata* Pfeffer, 1884, also from an unknown locality. The specimens mentioned by Massy (1928, p. 95) from Tongaat Beach, Natal, probably belong to *S. cyanea* and not to *S. obtusata*.

Diphtherosepion dabryi Rochebrune, 1884, was based on different species, one of them being *Sepia esculenta* Hoyle, another probably *Sepiella japonica*; the original description of the shell seems to apply to the former species (see Adam, 1944, p. 221).

The type of *Sepiella maindroni* Rochebrune, 1884, is without any doubt a female *S. inermis* (Férussac & d'Orbigny), but, as already indicated, the material mentioned by several authors from Japan, probably belongs to *S. japonica* (see Adam, 1944, p. 224). Hoyle's specimen is actually in poor condition and does not permit us to verify his statement that there are about ten rows of tentacular suckers, but the shell proves that it belongs to *S. japonica*.

The specimen identified with some doubt by Hoyle (1886, p. 137) as *Sepia recurvirostra* Steenstrup, 1875, consists of a fragment with a completely worn ventral surface, but the general outline and the dorsal surface leave little doubt that it belongs to *S. japonica*.

All Japanese references of *S. inermis* as indicated are probably records of *S. japonica*.

The latter is characterized by its large size (Sasaki 1929, p. 221, mentions a male specimen of 180 mm in mantle-length) by its regularly elongate-oval shell, without any sexual dimorphism, and by its tentacular club with at least 20 series of minute suckers.

IV. SYSTEMATIC CLASSIFICATION OF THE SEPIIDAE

DURING the last two hundred years a number of attempts have been made either to sub-divide the genus *Sepia* or to classify the different species in supra-generic categories.

The earliest and most simple classification was that of Linnaeus (1758) who classified all the known Cephalopoda in three genera: *Argonauta*, *Nautilus* (including the actual genera *Nautilus* and *Spirula*), and *Sepia*, embracing all the other Cephalopoda known to this author: *octopodia*, *officinalis*, *media*, *loligo* and *sepiola*; of these species, only *officinalis* is a *Sepia* as we understand it.

On the other hand, the most complex classification is that of Iredale (1954, p. 81) who grouped the Australian cuttlebones in three families, four sub-families and 13 genera. If this author had made a revision of the Sepiidae of other parts of the world, he certainly would have created some more families, sub-families and genera.

After Linné's simple classification, very little was added to the knowledge of Cephalopoda during the second half of the eighteenth century. In 1799, Lamarck (p. 4) restricted the generic name *Sepia* to the species with a calcareous cuttlebone, viz., *Sepia officinalis* and *S. tuberculata*. In the second edition of Lamarck's *Histoire naturelle des Animaux sans Vertèbres* (vol. XI, pp. 369-372), which appeared in 1845, only the same two species of *Sepia* are mentioned, although several other species had already been described. In fact, in the same year d'Orbigny (pp. 261-298) listed 21 recent species of *Sepia*, most of which are still valid, as well as three species now of dubious value. He classified the species, the animal of which was known, according to the arrangement and the relative size of the suckers of the arms and tentacular club (pp. 264-265), thus:—

I. Sessile arms with equal suckers placed in four regular alternating lines.

1. Tentacular arms with unequal-sized cups placed in five or six lines—*S. bertheloti*, *S. hierredda*, *S. rouxii*, *S. savignyi*, *S. latimanus*, *S. officinalis*, *S. tuberculata*, *S. vermiculata*.

2. Tentacular arms with equal-sized cups placed in two¹ lines—*S. aculeata*, *S. blainvillei*, *S. inermis*, *S. oruata*, *S. rostrata*.

- II. Sessile arms with unequal-sized cups not placed in four regular lines—*S. capensis*, *S. elegans*, *S. orbignyana*.

Gray (1849, p. 98) partly adopted d'Orbigny's classification of the Sepiidae in sub-dividing the genus *Sepia* into a number of sections based on the number of series of arm-suckers and of tentacular suckers and their relative size as well as on the characters of the shell. Those species of which the animal was unknown were placed in the different sections according to the resemblance of their shell. One of these sections was named *Sepiella*.

Gray's classification was as follows:—

- I. Sessile arms with small equal cups placed in four regular alternating lines.
 1. Tentacular arms with unequal-sized cups placed in five or six lines—*S. officinalis*, *S. rouxii*, *S. vicellius*, *S. hierredda*, *S. latimanus*, *S. tuberculata*, *S. vermiculata*, *S. lefebvrei*, *S. gibbosa*, *S. apama*.
 2. Cups of tentacular arms in five or six series, sub-equal, moderate-sized.
 - a. Shell oblong: *S. lycidas*.
 - b. Shell elongate, narrow: *S. bertheloti*, *S. plangon*.
 3. Tentacular arms with unequal-sized cups placed in 10 series—*S. savignii*.
 4. Tentacular arms finned, with numerous, small, equal-sized cups, placed in eight or 10 lines.
 - a. Shell very narrow behind: *S. aculeata*, *S. rupellaria*, *S. elongata*, *S. sinope*.
 - b. Shell oblong, posterior end expanded, produced, cartilaginous, not beaked, convex beneath—*Sepiella*: *S. ornata*, *S. sinensis*, *S. microcheirus*.
 - c. Shell oblong, rounded behind, beaked: *S. rostrata*, *S. indica*, *S. myrsus*, *S. mestus*.
- II. Sessile arms with equal, small cups. The upper pair with two rows of cups—*S. elegans*, *S. orbignyana*.
- III. Sessile arms provided with very unequal-sized cups, the middle one largest. Shell narrowed behind—*S. capensis*.

With later knowledge of the Sepiidae we cannot entirely adopt these classifications which nevertheless have the merit of the first serious scientific approaches to the problem.

Steenstrup (1875, p. 468) created a new genus *Hemisepius* for a new species *H. typicus*, based on the characters of the animal and of the shell. In 1880 (p. 347) the same author redescribed Gray's section *Sepiella* as a separate genus and mentioned its morphological characters, especially the posterior gland and the characteristic locking-apparatus which differs from that of other Sepiidae in the cone-shaped tubercle and the corresponding depression. He also described the sexual difference in the shells of *Sepiella inermis*, but he was mistaken in considering Gray's *S. sinensis* as the male sex of *S. inermis*. In fact, the specimens which Gray called *S. sinensis* belong without any doubt to *S. japonica* Sasaki (see p. 128).

Rochebrune (1884, p. 74) proposed an entirely different classification of the Sepiidae, principally based on the characters of the shell and comprising ten genera: *Hemisepiion*, *Diphtherosepiion*, *Rhombosepiion*, *Sepiella*, *Lophosepiion*, *Spathidosepiion*, *Doratosepiion*, *Ascarosepiion*, *Acanthosepiion* and *Sepia*.

In his catalogue, Hoyle (1886, p. 230) commenting on this classification said, "most of these seem to me to be at most of subgeneric value, and there are so many points in which I find myself unable to follow Dr de Rochebrune that I have only given references to his paper in the case of his new

¹ The original text states "deux lignes", which is probably a printing error for "dix lignes".

species". Likewise, Sasaki (1929, p. 162) in his treatise on the Japanese Cephalopoda stated: "Some of them are grouped together into the genus *Doratosepion* by Berry. Although I adopted this view in one of my previous papers, here I am obliged to give it up, since the distinction of the sub-genus has become to me very vague with my own progress of the study on the subject."

In many respects we disagree with Rochebrune's classification and a few examples suffice to prove its fallacy. The author mentions as first species of his genus *Diphtherosepion*: *S. ornata* which is a *Sepiella*. In his genus *Rhombosepion* he enumerates *S. touranense* which is a synonym of *Sepiella inermis*. In *Sepiella* he places *S. lycidas* which is not a *Sepiella* at all but a species of the *Sepia aculeata* group. In *Lophosepion* he places *S. apama*, the animal and shell of which are completely different from the two other species (*S. lefebvrei* and *S. gibbosa*) for which the genus was created. He considers *S. fischeri* as an *Ascarosepion*, whereas this species is in fact only a form (or sub-species) of *S. officinalis*. Among the many species of *Acanthosepion* he mentions *S. rappiana* which is a synonym of *S. latimanus* which he enumerates under *Sepia*, and *S. hierredda* and *S. vermiculata* which are sub-species of *Sepia officinalis*. Finally he mentions *S. myrsus* under *Sepia*, whereas this shell, which seems to belong to *S. simoniana*, most resembles that of a *Spathidosepion*.

Hoyle (1885, p. 199) has created a sub-genus *Metasepia* for *S. pfefferi* because of its peculiar shell. For nearly 40 years no new attempts were made to classify the Sepiidae.

In 1923, Naef published his monograph on the Mediterranean Cephalopoda with an extensive study on the morphology and the phylogeny of the group.

He proposed to classify the Sepiidae (pp. 543 and 545) in three genera: *Sepiella*, *Hemisepius* and *Sepia*, and divided the latter genus in seven sub-genera: *Eusepia* (type: *S. officinalis*), *Parasepia* (type: *S. orbignyana*), *Acanthosepia* (type: *S. aculeata*), *Doratosepia* (type: *S. andreana*), *Platysepia* (type: *S. esculenta*), *Lophosepia* (type: *S. lefebvrei*) and *Metasepia* (type: *S. pfefferi*).

This classification was based on the morphological characters of the animal and the shell. As many species had been insufficiently described, the author was unable to revise all the Sepiidae, but in his opinion (p. 542) a natural system would result easily if the main characters of the animal and of the shell of each species were described.

Unfortunately, Iredale neglected this sound advice when he began the description of the Australian Sepiidae in 1926. Although he stated (1926, p. 188): "I have examined animals of half of the species represented in the Australian Fauna, and propose to describe them in my larger essay," he never described a single animal and his numerous new species and genera were only based on the shells. In 1954 (p. 63) he mentioned that "Animals are still being acquired with the hope of providing some stable means of determination, but at the present the bones are the only sure means of differentiation". In this paper the author presents the following check list of the Australian Sepiidae (p. 81):—

Family Sepiidae

Sub-family Solitosepiinae

Genera: *Solitosepia*, *Blandosepia*, *Mesembrisepia*, *Amplisepia*, *Decorisepia*, *Glyptosepia*.

Sub-family Doratosepiontinae

Genus: *Arctosepia*.

Sub-family Tenuisepiinae

Genus: *Tenuisepia*.

Sub-family Acanthosepiontinae

Genera: *Acanthosepion*, *Crumenasepia*, *Ponderisepia*.

Family Sepiellidae

Genus: *Sepiella*.

Family Metasepiidae

Genus: *Metasepia*.

In the foregoing descriptive part we have expressed our opinion sufficiently on the numerous species and genera created by Iredale, whose concepts of systematic categories seem to differ so considerably from ours. Most of the species of his genera are in our opinion only individual, sexual or geographical variations of a same species; some of his genera and even sub-families or families have only generic or probably sub-generic or specific value. His genus *Arctosepia*, for example, was created (1926, p. 193) "In order to enable correct study of the Australian animals to be undertaken"; the descriptions of the different species of this genus(?) do not reveal a single generic character which permits to separate it from Rochebrune's genus *Doratosepion*. In his genus *Solitosepia* he (1954, p. 66) considers *submestus*, *lana*, *galei* and *papuensis* as species in the super-species or group of *papuensis*; in our opinion this super-species is only a species.

In 1939, Adam revised the Indo-Malayan species of *Sepia* and all the species of *Sepiella*. For the former genus he concluded that the shell and the tentacular club presented the best characters for distinguishing the species but that our knowledge of this genus was not yet sufficient to establish the phylogenetic relations between the different species and hence to arrive at a satisfactory systematic classification.

Such a classification should be based on the characters of the animal and the shell of the recent species and on their relationship with the fossil species of which only the shell is known. As we mentioned on p. 132, Naef (1923, p. 542) was very optimistic about the results of such a study, perhaps because he had only examined a few species. Unfortunately it often happens that the more species that are studied, the more difficult a classification becomes. In fact, if we had a thorough knowledge of all the fossil and recent species which have existed and exist it would probably be difficult to recognize any species at all. We should be able to study evolution as we study embryological development, but unless evolution had proceeded by sudden important mutations, a sub-division into systematic categories would be purely arbitrary.

In the descriptive part of our paper we have revised all the recent species of Sepiidae. If we exclude the species which, in our opinion, can be placed in synonymy, there remain about 108 species (see p. 145), some of which may also have to disappear. Of less than half of these species (53) both sexes of the animal have been described and their shell is generally sufficiently known. Thirteen species are known only from the male animal and its shell, a dozen only from the female animal and its shell, four are insufficiently described and of 30 species only the shell is known; among the latter, 28 are Australian species, more than half of which will probably have to be placed in synonymy.

According to Hoyle (1886, p. 148) "the problem of the natural relationship of the various species of *Sepia* is far from having been satisfactorily worked out. The shells, which seem in many respects the organs most likely to lead to a solution, can be arranged in series increasing or decreasing in complexity, and there are several interesting fossil genera, which help to bridge over the gulf separating *Sepia* from the Belemnites, but an arrangement of the species based upon the shells does not agree with one based upon the form of the tentacular club, or other parts of the animal's organization, so that we are hardly justified in regarding it as natural".

If we wish to arrive at a natural classification we have to establish the connexion between the recent and the fossil forms. Unfortunately the latter are only known by their shells, which have been found exclusively in European tertiary layers, whereas the majority of the recent species inhabit other parts of the world. We have no certainty at all that these recent species are the descendants of the European fossil species, we do not even know if they have a monophyletic or a polyphyletic origin.

The Miocene and Pliocene species which seem to belong to the genus *Sepia* do not show enough details to allow a comparison with the recent species. According to Naef (1922, p. 92) some of them show a faint indication of the remains of the pro-ostracum as in some recent species of the *aculeata*-type. These Miocene forms seem to be the descendants of the Eocene *Belosepia*.

This genus which was created by Voltz (1830, p. 410) for *Beloptera sepioidea* Blainville, 1825, has

been described and figured in detail by Edwards (1849, pp. 23–25, pl. I) in his monograph of the Eocene mollusca. Generally only the posterior part of the shells of *Belosepia* is preserved; they show great resemblance to the recent cuttlebones although the septa of the phragmocones are always lacking and represented only by small fragments near the end of the funnel-shaped posterior portion of the conotheca. At first sight this conotheca seems to differ a great deal from the inner cone of the recent cuttlebones which is fork-shaped. In his detailed description of the shell of *Sepia*, Appellöf (1893, p. 6) states that the lateral limbs of this fork ("Gabel") are in close contact with the septa of the phragmocone and in his figures (pl. I, fig. 4, pl. II, fig. 3) they seem to be separated without a connexion on the dorsal side of the phragmocone, which seems to be fused immediately to the inner plate of the dorsal shield. But when we dissolve a cuttlebone in acid it becomes clear, as Naef (1923, p. 522) has already observed, that the conotheca separates the whole phragmocone from the dorsal shield as a very thin chitinous membrane and that the inner cone is really homologous with the ventral part of the conotheca of *Belosepia*. If we assume that *Belosepia* is the ancestor of the recent Sepiidae, we can admit that those forms which have the ventral part of the inner cone still well developed are primitive.

The striated area of the phragmocone which seems to represent the siphuncle of *Belosepia* does not seem to be of much systematic value.

Denton & Gilpin-Brown (1961, p. 319) have shown that cuttlefish use their shell "as a variable buoyancy tank" and "that liquid is probably moved in and out of the cuttle-bone by an osmotic mechanism". In fact, "the chambers of the cuttlebone contain liquid as well as gas, and the cuttlefish changes its density and posture by varying the amounts of liquid which the chambers of the bone contain". Their experiments (pp. 333–335) show that liquid exchange can occur across the striated area, which they call the "siphuncular surface", the latter being covered by a specialized membrane in which, through a special drainage system, liquid from the circulation comes into close communication with the liquid within the cuttlebone. The authors (pp. 335–336) examined the bones from different species of *Sepia* and found "that they differed appreciably in the ratio of siphuncular surface area to the total surface area of the cuttle-bone" and that they "expect that the species with cuttlebones with relatively large siphuncular surfaces are those which can change their density most quickly". They made their experiments with *Sepia officinalis* from the trawling grounds off Plymouth, mostly in depths between 25 and 40 fms.; unfortunately we are not told which sub-species (*officinalis* or *filliouxii*). In answer to our enquiry about this question, Dr Denton replied that in his opinion these forms belong to the same species. This we do not contest, but in the light of their results it may be very important to know if these bones belonged to *filliouxii*, with its long striated area, or to *officinalis* which has a much shorter siphuncular surface.

In fact, the sub-species *filliouxii* seems to be the only one which migrates in the spring into the North Sea to spawn. As its large siphuncular surface permits quick changes of its density and hence quick adaptation to environments of different density, this character may be closely related to the migratory habits of this form.

On the other hand, the capacity of the air and liquid chambers of the phragmocone must be certainly related to the density of the environment and to the possibility for the animal to adapt itself to different environmental conditions. The convexity and the width of the phragmocone give us an idea about the total capacity of the chambers.

In this connexion it is perhaps worthwhile to note that the species with the relative highest phragmocone: *Sepia gibba*, *S. dollfusi* and *S. elongata*, live in the northern part of the Red Sea, in waters of very high salinity (about 40‰ in the Gulf of Eylath; see Oren, 1960, p. 12). Unfortunately we know very little about these species of which only a few animals have been collected in shallow waters and we do not know their exact bathymetrical distribution and their eventual migratory habits. In these waters it is of course very easy to float, but diving in deeper waters demands either an important

energetic effort or the capacity for the animal to greatly increase its density. Under these conditions the larger volume of the phragmocone is certainly a very favourable asset.

The third character of the shell which we have to discuss is the presence or absence of a posterior spine. In *Belosepia* this spine is always present and very strong. In recent *Sepiidae* the spine is more or less developed in a great number of species, but may be reduced or even be completely absent. According to d'Orbigny (1845, pp. 139) and Edwards (1849, pp. 15-16), this spine breaks the force of the shocks caused by the body striking against any hard substance in its backward movement. The former author states that he has always observed in *Sepia* that the extremity of the spine projects beyond the body and that it is not improbable that this part of the shell may be used for defensive purposes and can be protruded at the will of the animal!

According to Abel (1916, pp. 160-161) the spine of *Belosepia* is not homologous with the rostrum of the Belemnites. He does not consider it as a rudimentary formation and thinks that it functioned as a plough through the marine vegetation or the soft mud. In his opinion the spine of *Sepia* is certainly homologous with that of *Belosepia* (p. 162). He states that the fact that the spine of *Sepia officinalis* increases during its whole life in length, volume and strength and only pierces the mantle at an advanced age at which it often becomes worn when the animal digs itself in in the mud or ploughs through the forests of algae or the meadows of *Zostera*. He asserts that this spine is not at all a functionless, rudimentary organ, but a developing, orimetary formation!

All these statements are rather fantastic. In well preserved specimens we have never seen that the spine pierces the mantle; this may occur through contraction of the mantle during fixation or in macerated specimens. It is difficult to imagine that the spine of recent *Sepiidae* which is generally delicate could break the shock when the animal strikes against any hard substance in its backward movement; at the first shock it would probably break off. Its use for defensive purposes is still more fanciful. As it is generally directed straight backwards or towards the dorsal side we do not understand how the animal could use it as a plough. In *Sepia officinalis hierredda* and *S. officinalis vermiculata* it remains free of chitin in all growth stages, but in the other sub-species it becomes more and more covered by the chitinous posterior hood and never pierces the mantle.

If the spine of recent *Sepiidae* has any function at all it is probably only that of a solid support which determines the torpedo-like shape of the mantle, useful in backward movement.

As all the authors agree that the spines of *Belosepia* and of *Sepia* are homologous, we presume as already indicated, that the presence of a well-developed spine in recent species can be regarded as a primitive character. As to the presence of a ventral or a dorsal or of two keels on the spine, we do not know whether they have any significance.

The interpretation of the characters of the animals is much more difficult because no fossil remains are known.

Naef (1915, fig. 255; 1922, p. 45, fig. 11; 1923, p. 479, 488, fig. 260) has reconstructed a hypothetical prototype of the Sepioidea, which he named *Protosepioidea*. The only characters of this prototype which we wish to retain as a possible basis for the discussion that follows are: 1. the arrangement of the arm-suckers of equal size in four longitudinal series; 2. the arrangement of the tentacular suckers of uniform size in eight longitudinal series in the middle of the club, and the protective membranes separated at its base; 3. the presence of small suckers at the tips of the buccal membrane.

Most of the recent species have their sessile arms covered with suckers in four series, but in some this arrangement is partially or totally replaced by a biserial one. In many species the suckers of the male are more globular than in the female. The denticulation of the chitinous ring of the arm-suckers generally cannot be used for systematic purposes, in most species the ring is irregularly incised in young specimens but is sometimes smooth in old ones.

The length of the arms is subject to great variations depending on the state of conservation. In some species certain arms of the males are much longer than the other ones, for example the dorsal

arms of *Sepia pardalis*, *S. incerta*, *S. lorigera*, *S. longipes*, *S. tenuipes*, the dorso-lateral arms of *S. andreana* and *S. peterseni*, the dorsal and ventral arms of *S. erostrata*. Moreover these longer arms may present other modifications like the membraneous expansions of the dorsal arms of *S. incerta* and *S. exsignata* (the latter being probably the male of *S. burnupi*).

With a few exceptions (*S. latimanus* and *S. papuensis*) the males of all the species have their left ventral arms modified. This hectocotylization consists of a reduction of the size of some of the transverse rows of suckers and may affect the basal, middle, or distal part of the arm. This modified portion often shows strong fleshy transverse ridges and wider protective membranes. Exceptionally, the suckers of the right ventral arm show a sexual dimorphism, as in *S. elobyana*, where certain suckers have their chitinous rings strongly developed. In the species of *Sepiella*, the arm-suckers show a distinct sexual dimorphism in the dentition of the chitinous ring, the distal part of which is armed with strong, pointed teeth in the males.

In *Hemisepius typicus*, *Sepia hieronis* and *S. robsoni* some of the arm-suckers of the males or of both sexes are larger than the other ones. This character is an unusual one in the Sepiidae but common in the Sepiolidae.

A very peculiar secondary sexual character is present in the males of *S. confusa* where the fins are prolonged at their posterior end in a long tail-like formation.

The tentacles of the Sepiidae differ in two essential points from those of the other decapod Cephalopoda. They can be completely retracted in a special pocket and be suddenly projected for the capture of a prey. On the other hand the tentacular club differs: *a*, in the approach of the swimming-membrane to the dorsal protective membrane and the development of a deep cleft between these two membranes; *b*, in the enlargement and thickening of the ventral protective membrane which becomes partially part of the sucker-bearing surface. In most species the protective membranes remain separated at the base of the club, but in some they become fused so that the sucker-bearing surface is completely separated from the tentacular stem. This character is particularly evident in *S. latimanus*, *S. apama* and *S. bandensis* and in a lesser degree in *S. tuberculata*, *S. papillata*¹, *S. papuensis*, *S. elliptica* and *S. plangon*.

In most species the arrangement of the tentacular suckers is in eight longitudinal series. This is best seen in species with sub-equal suckers, but in those with unequal suckers the transverse rows become more and more oblique and the number of longitudinal series seems to be reduced. In fact the original arrangement of eight series can nearly always be retraced.

In a few species with very small equal suckers these are arranged in more than eight series, with a maximum of about 24, or even more, in *Sepiella japonica*. This increase in the number of series of suckers may differ in the males and females of a same species, the latter having more series than the former, as in *S. aculeata* and *Sepiella ornata*. Generally the tentacular club presents very distinct specific characters although there may be some variation in the size of the suckers.

Probably the arrangement in eight series of equal suckers is the primitive one from which the other forms are derived. As the function of the tentacles is the capture of prey, it would be very interesting to study the structure of the tentacular club and the size and number of its suckers in relation to the sort of prey which is captured.

The buccal membrane of some species possess a few minute suckers at its tips. Unfortunately these very tiny suckers are easily overlooked or lost. Their presence probably constitutes a primitive character.

In most species the ventral part of the buccal membrane of the females is largely expanded and wrinkled and functions as a depository for the spermatophores (Tompsett, 1939, p. 20 calls it a "burs copulatrix").

¹ According to Voss (1962b, p. 251) the protective membranes do not unite proximally.

In some species this ventral part of the buccal membrane contains one or two spermathecae. In well preserved specimens the openings of these formations are easily seen as nipple-like structures, otherwise they are only detected after dissection. The material we had at our disposal did not allow a detailed study of this character.

In *Sepia officinalis*, *S. bertheloti* and *Sepiella ornata* there is one pair of spermathecae, whereas *S. elegans* and *S. orbignyana* possess a single median one.

The internal anatomy of most species has never been described and the specimens we examined did not permit a detailed study. Therefore a classification of the Sepiidae can for the moment only be based on the external morphological characters and on those of the shell.

If we consider the strong development of the ventral part of the inner cone, the presence of a posterior spine and of sub-equal tentacular suckers as primitive characters, the following species seem to be more or less related: *S. thurstoni*, *S. brevimana*, *S. zanzibarica*, *S. lycidas*, *S. savignyi*, *S. aculeata*, *S. elliptica*, *S. whitleyana*, *S. esculenta*, *S. smithi* and *S. pageora*.

Among these species, *S. thurstoni*, *S. brevimana*, *S. zanzibarica* and *S. lycidas* have eight series of sub-equal tentacular suckers; in *S. zanzibarica* these are less equal than in the other ones and in *S. brevimana* the seriation is less distinct. *S. savignyi* may be added because of its tentacular suckers, but the posterior part of the inner cone is less developed. These five species have a well developed median groove on the ventral part of the shell. As for the lateral limbs of the inner cone, these are widest in *S. thurstoni*, *S. brevimana* and *S. savignyi*, they are somewhat narrower in *S. zanzibarica* and still more so in *S. lycidas*. In *S. savignyi* the marginal parts of the lateral limbs are shiny and flattened.

In *S. aculeata*, *S. elliptica* (which is probably identical with *S. whitleyana*) and *S. esculenta*, the inner cone is also strongly developed, but the tentacular club has about 12 series of sub-equal suckers.

As regards the inner cone, *S. aculeata* more closely resembles *S. thurstoni*, but the ventral surface of the phragmocone is convex. *S. elliptica* and *S. esculenta* possess the well developed ventral groove of the first group but the posterior part of the inner cone is different from most of them, consisting of a flat ledge with a thickened anterior margin, as in the female of *S. brevimana*. At the end of this evolutionary (?) series we have *S. smithi* and *S. pageora* which are perhaps conspecific. Their shells more closely resemble those of the first group, especially *S. thurstoni* and *S. brevimana*, because of the wide smooth zones between the striated area and the outer cone. Their tentacular clubs have very numerous tentacular suckers, arranged in about 20 longitudinal series.

All these species have quadriseriate arm-suckers and some of them possess a few buccal suckers: *S. zanzibarica*, *S. lycidas*, *S. savignyi* and *S. aculeata*.

The males of nearly all these species have the modified portion of the hectocotylus situated on the basal half of the left ventral arm; this is preceded proximally by a few transverse rows of normal suckers. Only *S. zanzibarica* seems to be different and has the hectocotylus situated on the distal third of this arm according to Massy (1925, p. 211). We wonder if this statement is correct as this author mentions six transformed rows of suckers, "arranged so as to leave a bare flattened surface with ridges bordered by a single row of suckers ventrally, while those of the dorsal side are crowded together". It is difficult to imagine that six rows of distal suckers, which are generally minute, would occupy a third of the arm.

Several species of this first group have been described as belonging to the genus or sub-genus *Acanthosepion*. For *S. esculenta*, Naef (1923, p. 546) created a sub-genus *Platysepia*, whereas Iredale (1926a, p. 239) established a sub-genus *Fiscisepia* of *Acanthosepion* for *S. elliptica*. As the shells of both these species do not show any sub-generic and even hardly specific differences, we consider *Fiscisepia* as synonymous with *Platysepia*. If this sub-genus is based on the characters of the shell, the female of *S. brevimana* ought to be placed in *Platysepia* and the male in *Acanthosepion*. If the number of series of tentacular suckers is taken as a base for sub-division, we can distinguish those

with eight series, with 12 to 14 and with about 20 series. In that case *S. aculeata* and *S. esculenta* belong to the same group but their shells would belong to different sub-genera. We could work out a classification based on several characters, but finally nearly every sub-genus or section would only contain a single species and in the case of *S. brevimana* the males and females would have to be placed in different categories, which proves the fallacy of such a system.

Two other species, *S. pharaonis* and *S. prashadi*, possess a well developed ventral part of the inner cone but have unequal tentacular suckers. In *S. pharaonis*, the posterior part of the inner cone forms a long, flat ledge, applied to the striated area, and the third and fourth tentacular suckers of the transverse rows are distinctly wider than the other ones. The buccal membrane bears some minute suckers and the hectocotylus is situated more in the middle of the arm than in the foregoing species, there being twelve rows of normal suckers at the base, followed by ten rows of modified suckers. Forms of this species have been placed by different authors in three different genera or sub-genera: *Acanthosepion*, *Ascarosepion* and *Crumenasepia*. The peculiar form of the inner cone is certainly very characteristic, but we consider it only of specific value. In fact, in our opinion all the species described as possessing this peculiar inner cone which would justify their classification in the genus or sub-genus *Crumenasepia*, belong to a single species: *S. pharaonis*.

As for *S. prashadi*, the ventral part of the inner cone is more like that of *S. aculeata*, but the spine is keeled on the ventral and dorsal sides. The tentacular suckers are very unequal, those of the third series being enormously developed. The transformed part of the hectocotylus is situated at the base of the arm, where two rows of normal suckers are followed by a dozen rows of modified ones.

Although the above-mentioned 13 species have several characters in common, there are different tendencies in the development of the tentacular club: either the suckers remain sub-equal and their number of longitudinal series increases, or the original arrangement of eight series remains and the suckers become unequal, only slightly in *S. zanzibarica*, but very strongly in *S. prashadi*. But if the presence of keels on the spine constitutes an important character, which we do not know, it may be that this latter species belongs to another group.

In a second group, or probably several groups of species, the inner cone is still well developed, with wide limbs, but it is completely reflected on to and fused with the outer cone. Among these species we can distinguish those that possess a well developed posterior spine, which may become covered by a chitinous hood in the adult shells, and those that are completely devoid of a spine and which we discuss separately on p. 142.

All these spined species have unequal tentacular suckers, generally arranged in eight longitudinal series, although this arrangement is not always easily detected.

An intermediate form between the species with a free posterior part of the inner cone and those with a completely fused inner cone, is *S. recurvirostra*, where the posterior portion of the inner cone forms a thin, free ledge which is connected with the outer cone by a thick callous substance. *S. recurvirostra* has unequal tentacular suckers, which seem to be arranged in five or six series, it may possess some buccal suckers, and the shell has a spine without keels.

Among the spined forms with completely fused inner cone, *S. officinalis*, with its sub-species, has the tentacular suckers very unequal, those of the third series being largest. The protective membranes of the tentacular club remain separated at the base. In the two southern sub-species, *hierredda* and *vermiculata*, the spine is always uncovered, but in the northern ones, *officinalis* and *filliouxii* it becomes more and more covered by the chitinous hood in the adult shells. The hectocotylus has about three groups of four normal suckers at its base, followed by eight to 13 transformed rows in *hierredda* and *vermiculata*, but only five to seven in *officinalis* and *filliouxii*.

Although *S. officinalis* is the type of the genus *Sepia*, its sub-species have been mentioned by several authors as belonging to different sub-genera or genera: *Acanthosepion*, *Ascarosepion* and *Eusepia*.

The shell of *S. latimanus* differs from that of *S. officinalis* in its much stronger posterior spine.

The tentacular club of the former species is completely different, the protective membranes being fused at the base and the sucker-bearing surface detached from the stem.

Exactly the same kind of tentacular club is found in *S. apama*, but the shell of the latter is completely different, its posterior end being drawn out in the adult, the spine generally completely covered and the inner cone fused and equally drawn out. In a medium-sized shell, this peculiar transformation of the posterior part does not yet exist, but already at this size it has the callous-like formation situated in the inner angle of the inner cone. The shells of very young specimens are very interesting, strongly resembling those of *S. bandensis*, except that the latter has no spine. The animals of *S. bandensis* and the young *S. apama* are completely similar and cannot be distinguished externally. If the tentacular club has any systematic importance, *S. bandensis* is most closely related to *S. latimanus* and *S. apama*, but the shell of *S. bandensis* more resembles those species which Iredale placed in his genus *Blandosepia* (the animals of which are unknown), and still more that of *S. tuberculata* from which it can hardly be distinguished. In the latter species the protective membranes of the tentacular club are also fused at the base, but the sucker-bearing surface is not detached from the stem.

It is noteworthy that the male of *S. latimanus* does not show any trace of hectocotylization of its left ventral arm, whereas in *S. apama* this arm is normally hectocotylized with eight rows of normal suckers at its base, followed by eight rows of transformed suckers.

Sepia latimanus has been placed in *Acanthosepion* by some authors, but Iredale (1926a, p. 239) has created for it a new genus *Ponderisepia*. For *S. apama*, this author created (1926, p. 194) a new genus *Amplisepia*, which Thiele (1934, p. 954) considered as a synonym of *Ascarosepion*, but his opinion was based on the erroneous interpretation by Iredale of *Ascarosepion verreauxi* Rochebrune (see p. 47).

Sepia papuensis retains the broad limbs of the inner cone and the posterior part of the fused inner and outer cone forms a chitinous ledge surrounding the posterior depression, but the spine is keeled ventrally. The protective membranes of the tentacular club are fused at the base, but the sucker-bearing surface is not detached from the stem as in *S. latimanus* and *S. apama*. As in *S. latimanus*, the male of *S. papuensis* does not show any trace of hectocotylization. Iredale (1954, p. 66) considers *S. papuensis* as a super-species or group of his genus *Solitosepia* and admitted *submestus*, *lana*, *galei* (= *occidua*) and *papuensis* as species in this super-species (see p. 40).

Sepia plangon seems to be closely related to the foregoing species, the tentacular club is the same, but the shell differs in the narrower limbs of the inner cone and in the deep, narrow, median groove. The left ventral arm of the male is hectocotylized with five rows of normal suckers at its base, followed by five rows of transformed suckers.

Like the two foregoing species, *S. mestus* has a ventrally keeled spine, but the inner cone has broader limbs. The animal of this species is unknown, unless the specimen from N. China (p. 45) really belongs to this species.

These three species which have a ventrally keeled spine were placed by Iredale in his genus *Solitosepia* (1926, p. 188), which is synonymous with *Ascarosepion* Rochebrune.

A further species with a well-developed inner cone is *S. novaehollandiae*. The limbs of its inner cone are slightly narrower than in *S. mestus* and the spine has no keels. The animal is not known with certainty. For this and some similar species(?), Iredale (1926, p. 191) created a new genus *Mesembrisepia*.

In the first group of species with characters which we supposed to be primitive, there seems to be a certain relationship between the different species. But in the second, in which the ventral part of the inner cone is reduced, although still well developed, and fused with the outer cone, most species show very little relationship among each other and these seven species have been classified by different authors in a great number of sub-genera or genera: *Sepia*, *Acanthosepion*, *Ascarosepion*, *Ponderisepia*, *Amplisepia*, *Solitosepia* and *Mesembrisepia*.

All the other spined species have a still more reduced inner cone with narrow limbs. The tentacular suckers are nearly always arranged in eight longitudinal series. Sometimes there are apparently fewer series, but in most of these cases the suckers are undoubtedly arranged in oblique transverse rows of eight.

In nearly all the species of this third group, the outer cone has two posterior wings, which form, in the narrower shells, a typical cup-like expansion. As to the spine, it is generally devoid of keels but may sometimes be keeled, dorsally, ventrally or on both sides.

In a first sub-group the outer cone shows no wings or cup. *Sepia acuminata* has a rather broad shell with a keel-less spine. The minute, sub-equal, tentacular suckers are arranged in eight to ten series. The hectocotylus has six rows of normal suckers at its base, followed by nine rows of transformed suckers. This species seems to be closely related to the Japanese *S. madokai* (p. 56) and to the Australian *S. rex* (p. 56). *S. jaenschi*, which is probably identical with *S. rex* has a similar shell, but the animal is unknown.

Sepia bertheloti has a much more elongate shell, a keel-less spine and slightly unequal tentacular suckers, arranged in eight series. Its hectocotylus has a few normal suckers at the base, followed by nine to 13 rows of transformed suckers. The animals of this species are not easily distinguished from *S. officinalis*, but the ventral arms of the male are relatively much longer and the largest tentacular suckers smaller.

Sepia cultrata has a dorsal and a ventral keel on its spine; the small, sub-equal tentacular suckers seem to be arranged in five series. The male of this species is unknown.

The species of this sub-group have been classified in different sub-genera or genera: *S. bertheloti* in *Acanthosepion*, *S. acuminata* in *Rhombosetion*, *S. rex* and *S. jaenschi* in *Decorisepia*, and *S. cultrata* in *Glyptosepia*. The latter genus was created by Iredale (1926, p. 191) for shells characterized by the loss of the inner cone, but there does not exist a single species of Sepiidae without an inner cone!

In a second sub-group, the shell possesses a posterior cup-like expansion and keel-less spine whereas the tentacular club has sub-equal suckers.

Sepia appellöfi and *S. tenuipes* have eight series of minute, sub-equal tentacular suckers. In *S. sewelli* this arrangement is less distinct, the sucker-bearing surface being narrower. In *S. murrayi* this is still more pronounced and there seem to be only five series of tentacular suckers. With the reduction of the sucker-bearing surface, the width of the free portion of the dorsal protective membrane becomes more important. Of these four species only the males of *S. appellöfi* and *S. tenuipes* are known, that of the former has 12 rows of normal suckers at the base of the hectocotylus, whereas the distal third of the arm is transformed; that of the latter has seven or eight rows of normal suckers at the base and the distal half is transformed.

Moreover, the male of *S. tenuipes* has its dorsal arms twice as long as the others.

In a third sub-group the shell also possesses a posterior cup-like expansion and a keel-less spine, but the tentacular suckers are unequal. In some species the ventral part of the inner cone forms a short, rounded ledge.

In *S. confusa* the tentacular club is well developed with rather numerous suckers, that are distinctly unequal in size, but less so than in the following species. The male of *S. confusa* does not show any hectocotylization of its ventral arms, but has an unique tail-like formation of the fins. The shell of *S. confusa* resembles that of *S. pardalis*, but this Japanese species lacks the peculiar tail and has a distinct hectocotylus with about 17 rows of normal suckers proximally and the distal third of the arm is transformed; here the minute sub-equal tentacular suckers are arranged in eight series, as in *S. appellöfi*.

In *S. incerta*, the median tentacular suckers are relatively much bigger than in *S. confusa*. The male of this species possesses not only a hectocotylus with the distal half of the arm transformed, but also a very peculiar transformation of the dorsal arms. *S. lorigera* seems to be very closely related to *S.*

incerta in the characters of the shell and of the animal. *S. longipes* is also very similar but has both ventral arms of the male hectocotylized.

Sepia joubini has a similar tentacular club, but the shell of this small species is imperfectly known; the original description stated it to be of the *Doratosepion* type with a spine. The female of this species has very narrow lateral arms that are whip-like in their distal halves, and are armed with minute biserial suckers. The hectocotylization of the left ventral arm of the male is little pronounced, six rows of suckers on the distal half of the arm being modified.

In *S. kobeensis*, the sucker-bearing portion of the tentacular club is relatively narrower and the free margin of the dorsal protective membrane is wider. The hectocotylus has about 12 rows of normal suckers at its base, whereas the greater part of the distal half of the arm is transformed. The ventral part of the inner cone forms a more or less developed posterior ledge.

The shell of *S. andreana* resembles that of *S. kobeensis*, but the animal is different, the dorso-lateral arms of the male being about three times as long as the others. The hectocotylus is transformed in its distal half.

Sepia peterseni is also a closely related species with very long dorso-lateral arms in the male and a similar hectocotylus, but it seems to be an inhabitant of temperate waters, whereas *S. andreana* is a cold water species.

Sepia tokioensis, which does not seem to differ essentially from *S. misakiensis*, has the hectocotylus only slightly transformed in its distal part. The fins are thickened and expanded into lobes at their posterior end.

The shell of *S. kiensis* is relatively broader and flatter than that of *S. kobeensis* and recalls that of *Arctosepia rhoda*. Only the female of *S. kiensis* is known.

Sepia braggi, the animal of which has not been described, has a very slender shell which recalls the shells of *S. burnupi* and *S. trygonina*. The latter are so much alike that they can easily be confused; both have the lateral limbs of the inner cone much closer together than in any other species, but the mid-dorsal rib of *S. burnupi* is more distinct than in *S. trygonina*. The hectocotylus of *S. burnupi* is unknown, but we presume that *S. exsignata* is synonymous with *S. burnupi*. *S. exsignata* has both ventral arms hectocotylized in their distal half with a reduction of the size of the suckers and with some cirri at their tips. Moreover the dorsal arms of the male are modified, the outer protective membranes possessing long, cirriform processes, the inner ones have shorter points. *S. trygonina* has no modification of the dorsal arms and only the left ventral arm is hectocotylized in its distal half.

Sepia elongata has a similar tentacular club and hectocotylus to *S. trygonina*, but the shell is distinctly different, the ventral surface being much higher and the limbs of the inner cone wider apart.

Many species of this third sub-group have been placed by different authors in the genus or sub-genus *Doratosepion*, but for the Australian species, the animals of which are unknown, Iredale (1926, p. 193) has created a new genus *Arctosepia*, which cannot be distinguished morphologically from *Doratosepion*. Those of the second sub-group have a similar shell, but sub-equal tentacular suckers.

In a fourth sub-group of the species with posterior wings at the outer cone, the spine is keeled.

Sepia orbignyana has a ventral keel on the spine and unequal tentacular suckers. The hectocotylus is transformed in its basal two-thirds. The female has only a single spermatheca.

Sepia australis possesses a dorsal keel on the spine which continues on the posterior part of the dorsal surface of the shell. The animal has very unequal tentacular suckers and the hectocotylus is transformed on more than its basal half, which bears two pairs of normal suckers, followed by 13 slightly alternate pairs of smaller ones.

The shell of *S. sulcata* resembles that of *S. australis*, but the tentacular club bears eight series of minute, sub-equal suckers. The hectocotylus is transformed in its basal three-fourths.

Sepia omani has a dorsal and a ventral keel on its spine and very unequal tentacular suckers. The hectocotylus has two groups of four normal suckers at its base, followed by about ten rows of trans-

formed suckers which cover two-fifths of the arm-length.

Finally there are three species in which the cuttlebone has posterior wings at the outer cone but is without a spine. Among these, *S. erostrata* has a rounded eminence at the posterior end of the shell, whereas *S. elegans* and *S. arabica* possess a dorsal keel as in *S. australis*. *S. arabica* has sub-equal tentacular suckers, but in *S. elegans* and *S. erostrata* they are very unequal. In the male of *S. erostrata* the only indication of a hectocotylization is a diminution in size of the suckers of the middle part of the left ventral arm. Moreover, the dorsal and ventral arms of the male are longer than the lateral ones. The male of *S. elegans* has a few normal suckers at the base of the hectocotylus which is modified on two-thirds of its length. In *S. arabica* the sucker-bearing surface of the left ventral arm of the male is folded together and nearly completely covered by the protective membranes; the right ventral arm shows the same phenomenon to some degree.

As in *S. orbignyana*, the female of *S. elegans* possesses a single spermatheca. For these two species, Naef (1923, p. 545) created a sub-genus *Parasepia*. In fact, these species have many characters in common, but they differ in the absence of the spine in *S. elegans*. For the latter species, Rochebrune (1884, p. 82) had already created the genus *Rhombosepion*.

If we reconsider all the species in which the shell has posterior wings or a cup-like posterior expansion, we see again several tendencies in the development of different characters. In all the species the inner cone has narrow limbs, but sometimes the posterior ventral part forms a small ledge surrounding a small depression; this feature can be considered a primitive character. Most of the species have a spine which may be keeled, but in some it is lacking. In the majority of these species, the hectocotylus is transformed in its distal part, but sometimes in its basal portion. In several species the arm-suckers are partly biserial, either at the base or at the distal part of the arms. As this character is sometimes rather obscure and may be differently developed in the males and the females of a same species we have not discussed it in detail. The tentacular suckers are sub-equal or more or less unequal, but they are never arranged in more than eight series.

All the other species are without spines and are quite different, possessing relatively broad shells with a more or less developed inner cone and without posterior wings at the outer cone.

Sepia dollfusi and *S. gibba* have the phragmocone strongly swollen and the broad lateral limbs of the inner cone are fused to the outer cone. The tentacular suckers are slightly unequal and arranged in eight series.

In *S. dollfusi* the buccal membrane may have a few minute suckers. The hectocotylus of both species has a few rows of normal suckers at the base, followed by about eight series of transformed suckers.

Sepia elobyana is a rather puzzling species (see p. 104): the type-specimen having very unequal tentacular suckers, whereas the other specimens have them sub-equal. The left ventral arm of the male is hectocotylized in its basal half, and the right ventral arm shows a very peculiar transformation of the chitinous rings in some of its suckers (p. 103).

In *S. bandensis* the shell is very flat, the inner cone being less developed than in the foregoing species. The tentacular club, with the protective membranes fused at the base, strongly resembles that of *S. apama* and of *S. latimanus*. Moreover, the shell of *S. bandensis* can hardly be distinguished from that of a young *S. apama*, but the latter has a spine and the former only a small posterior knob. The hectocotylus has four rows of normal suckers at the base, followed by seven rows of transformed suckers.

The shell of *S. tuberculata* closely resembles that of *S. bandensis*, but it has no posterior knob. The animal of the former is characterized by the peculiar patches on the ventral side of the mantle and of the ventral arms. The tentacular suckers are more unequal and although the protective membranes are fused at the base of the club the sucker-bearing surface is less detached from the stem. The hectocotylus is transformed in its basal half.

The animal of *S. papillata* can hardly be distinguished from that of *S. tuberculata*, but its tentacular

suckers are still more unequal. The shells are certainly related, but *S. papillata* has narrower limbs of the inner cone and a well-developed posterior knob.

The shell of *S. simoniana* is very similar to that of *S. papillata*, differing only by the lengthening of the posterior part of the inner cone. But the animal is distinctly different, lacking the peculiar ventral patches and possessing a very long tentacular club with minute suckers arranged in 24 series. The hectocotylus is transformed in its proximal half.

The shell of *S. hieronis* strongly resembles that of *S. acuminata*, having a faintly developed inner cone with narrow limbs, but possessing only a slight, blunt, posterior knob instead of a spine. The tentacular club has five series of minute, sub-equal suckers and a very broad dorsal protective membrane. The hectocotylus is transformed in its basal half. Moreover the male and the female have some enlarged suckers on their arms and most or all of their suckers are biserial.

The shell of *S. insignis*, with its long acuminate anterior part, does not seem related to any other known species. Its animal is unknown.

Although all these species have a spine-less shell, there does not seem to exist a close relationship between them. *Sepia dollfusi* and *S. gibba* are very similar and have been placed by some authors in the genus *Lophosepion*. The shell of *S. bandensis* recalls that of Iredale's genus *Blandosepia*. For *S. tuberculata* and *S. papillata*, Rochebrune (1884, p. 93) created the genus *Spathidosepion* and Robson (1924a, p. 645) placed *S. hieronis* in the genus *Rhombosepion*. The tentacular club of these species shows important differences: slightly or strongly unequal suckers in eight series, or very minute sub-equal suckers in 24 series.

Sepia pfefferi, for which Hoyle (1885, p. 199) created a sub-genus *Metasepia*, is distinguished by its rhomboidal shell, which is much shorter than the mantle, with a completely chitinous dorsal surface. Its tentacular suckers are very few in number, some of the median ones being enormously developed. The male of this species is unknown, that of the related *S. tullbergi* does not show any hectocotylization. The inner cone is very narrow, there is no spine, but *S. tullbergi* has a kind of posterior keel on the dorsal surface.

These two species are quite different from all the other Sepiidae and for them a sub-genus may be justified.

As for the genus *Hemisepius* which Steenstrup (1875, p. 469) created for *H. typicus*, it seemed amply justified by the characters of both the shell and the animal. The latter has two series of pores at the ventral side of the mantle; the suckers are biserial on all the arms with partly enlarged suckers in the male; the hectocotylus is transformed in its basal two-thirds. The very flat shell has the dorsal surface chitinous, the phragmocone much shorter and the rather broad, rounded limbs completely fused with the outer cone. Unfortunately, the discovery of a second species, *H. dubius*, the male of which is unknown, renders the value of some of the generic characters rather problematic. The animal has biserial arm-suckers, but no ventral pores on the mantle. In both species the tentacular club has four or five series of minute sub-equal suckers. The shell of *H. dubius* has its dorsal surface calcified with a reticulate pattern. The phragmocone has the same characteristic form; the broad limbs of the inner cone are much more distinct than in *H. typicus*.

A third species, *S. robsoni*, seems to be related in the form of the animal, the tentacular club, the hectocotylus and the biserial suckers, but it too lacks the ventral pores, and the dorsal arms of the male (the female is unknown) have fingerlike tips devoid of suckers. The shell of this species is in poor condition, completely chitinous and with its anterior part strongly acuminate; it resembles that of *S. hieronis*. The animal of the latter has some enlarged suckers on its arms, whereas this character is less pronounced in *S. robsoni*. More material of this species is required to establish its relationship with other species.

For the moment we think that the genus or sub-genus *Hemisepius* may be maintained for *H. typicus* and *H. dubius*, but its separation from other Sepiidae has become less distinct.

In the genus *Sepiella*, the animal and the shell possess sufficient characters to distinguish them from all other Sepiidae. The characteristic posterior gland and the form of the locking-apparatus do not occur in any other group. The differences between the species of *Sepiella* are little pronounced and concern principally the general form and proportions of the shell and the tentacular club which shows an increasing number of longitudinal series of suckers: eight to ten in *S. ocellata*, 10 to 14 in *S. ornata*, *S. cyanea* and *S. weberi*, 12 to 24 in *S. inermis* and 16 to 32 in *S. japonica*. The hectocotylus is transformed in its basal half, the arm-suckers of the male are armed with strong distal teeth.

If we summarize the results of this discussion, we see that only in the first group do several species present a number of primitive characters. In all the groups several characters seem to have evolved independently. The recent species represent the present end points in their evolution. It is possible that they illustrate evolutionary trends, but we are not sure that this can be correctly interpreted. We can compare them with a number of twigs or leaves from which we try to reconstruct a tree, but we do not know if they belong to the same stock or to several. Some characters seem to have evolved very little, others have undergone important modifications under the influence of internal or external causes. If we take one character as a starting point, we can classify the species in a certain system, but if we take another character the result of our classification is completely different and we doubt if our knowledge of the recent species of Sepiidae will ever allow a natural classification.

For several species we have been able to establish a close relationship, but only in the case of *Sepiella* can we separate its species without any doubt from all the other Sepiidae. This genus is characterized by a number of characters of the shell and of the animal. The shell seems to be highly evolved in the reduction of the inner cone and the absence (loss?) of a spine, but the tentacular club bears sub-equal suckers in an increasing number of longitudinal series.

In the case of *Hemisepius*, the situation is less clear. In fact, if we consider *dubia* to be a *Hemisepius*, one of the main characters of this genus, the presence of two series of ventral pores, cannot be maintained as a generic character, and the other features of the animal seem to be related to those of some other Sepiidae, like *S. robsoni* and *S. hieronis*. In this case only the shell of *H. typicus* and *H. dubius* permits us to separate them from all other Sepiidae and we prefer to regard *Hemisepius* as a sub-genus. This shell seems to be highly evolved in the reduction of the inner cone and in the absence of a spine, but the short phragmocone leaving a long pro-ostracum presents a very primitive character, unless the phragmocone has regressed.

Likewise, we may consider *Metasepia* as a sub-genus because of its peculiar shell, which is found only in *S. pfefferi* and *S. tullbergi*.

As to all the other species, we do not at present see a possibility of separating them in different genera or sub-genera, either by the characters of the animal or by those of the shell and certainly not by those of both the animal and the shell. The characters of the numerous genera and sub-genera (see p. 132) which have been created, are in each case only valid for one or a few species, but if we consider all the species of Sepiidae the limits become more and more vague and these generic categories purely arbitrary.

V. GEOGRAPHICAL AND BATHYMETRIC DISTRIBUTION

IN the following table we have summarized the data on the geographical and bathymetrical distribution. The latter is very imperfectly known; for more than half of all the species no data at all are available; as to the majority of the remaining species we possess only very few records. For a few species with a wide geographical distribution, the bathymetrical distribution seems to be related

to the former. For example: *Sepia elegans* has been mentioned in European waters from depths between 20 and 250 m, whereas this species has been found on the W. African coast between 80 and 430 m. *Sepia orbignyana* shows the same phenomenon—on the European coast between the surface and 100 m depth, but on the W. African coast between 116 and 430 m. But far too little is known to allow any general conclusions.

As to geographical distribution, it is first of all noteworthy that no Sepiidae have ever been found on the coasts of the American continent or on those of New Zealand, except as stranded cuttlebones.

In European waters only three species are known: *S. officinalis*, *S. elegans* and *S. orbignyana*, but these occur also on the W. African coast and *S. officinalis vermiculata* even in S. Africa.

On the W. African coast live three further Sepiidae which are endemic: *S. bertheloti*, *S. elobyana* and *Sepiella ornata*.

The S. African coast is rich in species (about fifteen), most of which (perhaps all of them) are endemic.

Nine species have been reported from the Red Sea, but only three of them, *S. elongata*, *S. dollfusi* and *S. gibba*, seem to be endemic in the highly saline waters of the northern part. The other ones extend into the Indian Ocean and *S. pharaonis* even into the Pacific as far as Japan and Australia.

Japanese waters have a very rich fauna with about fifteen endemic species.

The Australian fauna seems to be far the richest one in endemic species: even without counting the numerous species which are certainly or probably synonymous, there remain still about 20 species which seem to be endemic.

As to the remaining, Indo-Pacific species, many of them have only been found in very restricted areas but too little collecting has been done as to allow a clear picture of their geographical distribution. On the other hand, supplementary data are needed to establish the eventual relationship or even identity among species which have been described from far distant regions: as for example between *S. acuminata* (S. Africa), *S. madokai* (Japan) and *S. rex* (Australia).

The eventual existence of geographical races in Sepiidae can only be studied by means of numerous specimens. Only for *Sepia officinalis* a sub-division in geographical races has been worked out to some degree (see Adam, 1941).

Species	Distribution	Depth in metres	Animal described	Shell described	Remarks
SEPIA					
<i>S. aculeata</i>	Indo-Pacific	8-10	♂ + ♀	×	
<i>S. acuminata</i>	S. Africa	64-350	♂ + ♀	×	
<i>S. andreana</i>	Japan		♂ + ♀	×	
<i>S. apama</i>	Australia		♂ + ♀	×	
<i>S. appellöfi</i>	Japan		♂ + ♀	×	
<i>S. arabica</i>	Indian Ocean; Red Sea	97-270	♂ + ♀	×	
<i>S. australis</i>	S. Africa	2-457	♂ + ♀	×	
<i>S. bandensis</i>	Indian Ocean	12	♂ + ♀	×	
<i>S. bartletti</i>	Australia			×	
<i>S. baxteri</i>	Australia			×	
<i>S. bertheloti</i>	W. Africa	20-156	♂ + ♀	×	
<i>S. brachycheira</i>	New Guinea				insufficiently described.
<i>S. braggi</i>	Australia	139-176		×	
<i>S. brevimana</i>	Indo-Malayan		♂ + ♀	×	See Adam, 1965
<i>S. burnupi</i>	S. Africa	? 40-48	? ♂ + ♀	×	? = <i>S. exsignata</i>
<i>S. carinata</i>	Japan		♂ + ♀	×	
<i>S. chirotrema</i>	S. Australia	146-220	♂ + ♀	insufficient	
<i>S. confusa</i>	S. Africa	64-350	♂ + ♀	×	
<i>S. cottesloensis</i>	W. Australia			×	? = <i>S. rex</i>
<i>S. cultrata</i>	Australia	275-293	♀	×	
<i>S. dannevigii</i>	S. Australia	36-183	♀		
<i>S. dollfusi</i>	Red Sea	3.5-5.5	♂ + ♀	×	

Species	Distribution	Depth in metres	Animal described	Shell described	Remarks
<i>S. elegans</i>	Europe; W. Africa	20-430	♂ + ♀	×	
<i>S. elliptica</i>	Indo-Pacific	51-1000	♂ + ♀	×	
<i>S. elobyana</i>	W. Africa		♂ + ♀	×	
<i>S. elongata</i>	Red Sea		♂	×	
<i>S. erostrata</i>	Japan		♂	×	
<i>S. esculenta</i>	Japan		♂ + ♀	×	
<i>S. galei</i>	W. Australia		♂	×	? = <i>S. papuensis</i>
<i>S. gemellus</i>	Australia			×	
<i>S. genista</i>	W. Australia			×	? = <i>S. papuensis</i>
<i>S. gibba</i>	Red Sea	1	♂ + ♀	×	
<i>S. glauerti</i>	Australia			×	? = <i>S. mestus</i>
<i>S. hedleyi</i>	S. Australia	146-?820	♂ + ♀	insufficient	
<i>S. hendryae</i>	W. Australia			×	
<i>S. hieronis</i>	S. Africa	43-420	♂ + ♀	×	
<i>S. incerta</i>	S. Africa	49-70	♂ + ♀	partly	
<i>S. insignis</i>	S. Africa			×	
<i>S. irvingi</i>	W. Australia		♀	×	? = <i>S. novaehollandiae</i>
<i>S. jaenschi</i>	S. Australia			×	? = <i>S. rex</i>
<i>S. joubini</i>	S. Africa	66-99	♂ + ♀	insufficient	
<i>S. kiensis</i>	Arafura Sea	256	♀	×	
<i>S. kubiensis</i>	Japan	15	♂ + ♀	×	
<i>S. lana</i>	Australia			insufficient	? = <i>S. papuensis</i>
<i>S. latimanus</i>	Indo-Pacific	4-27	♂ + ♀	×	
<i>S. liliana</i>	Australia			×	? = <i>S. mestus</i>
<i>S. limata</i>	Australia			×	? = <i>S. braggi</i>
<i>S. longipes</i>	Japan		♂ + ♀	×	
<i>S. lorigera</i>	Japan		♂ + ♀	×	
<i>S. lycidas</i>	Indo-Pacific		♂ + ♀	×	
<i>S. macandrewi</i>	Australia			×	? = <i>S. novaehollandiae</i>
<i>S. macilenta</i>	Australia			×	not = <i>S. cultrata</i>
<i>S. madokai</i>	Japan		♂ + ♀	×	? = <i>S. acuminata</i>
<i>S. mestus</i>	Australia; ? China		? ♀	×	
<i>S. mira</i>	Australia			×	
<i>S. misakiensis</i>	Japan		♂	×	? = <i>S. tokioensis</i>
<i>S. murrayi</i>	Gulf of Oman	106	♀	×	
<i>S. myrsus</i>	? China			×	? = <i>S. simoniana</i>
<i>S. novaehollandiae</i>	Australia			×	
<i>S. occidua</i>	Australia			×	? = <i>S. papuensis</i>
<i>S. officinalis</i>	Europe-S. Africa	0-250	♂ + ♀	×	
<i>S. omani</i>	Gulf of Oman	201	♂ + ♀	×	
<i>S. opipara</i>	Australia			×	
<i>S. orbignyana</i>	Europe; W. Africa	0-430	♂ + ♀	×	
<i>S. ostanus</i>	Australia			×	? = <i>S. novaehollandiae</i>
<i>S. pageora</i>	Australia		♂	×	? = <i>S. smithi</i>
<i>S. papillata</i>	S. Africa	64	♂ + ♀	×	
<i>S. papuensis</i>	Indo-Pacific	51	♂	×	
<i>S. pardalis</i>	Japan		♂	×	
<i>S. parysatis</i>	W. Australia			×	? = <i>S. apama</i>
<i>S. peterseni</i>	Japan		♂	×	
<i>S. pharaonis</i>	Red Sea, Indo-Pacific	18-1000	♂ + ♀	×	
<i>S. plangon</i>	Australia	5.5	♂ + ♀	×	
<i>S. prashadi</i>	Red Sea, Indian Ocean	201	♂ + ♀	×	
<i>S. prionota</i>	Sulu Archipelago	44	♀	×	= <i>S. papuensis</i>
<i>S. recurvirostra</i>	China; Indo-Pacific	59-90	♂ + ♀	×	= <i>S. singaporensis</i>
<i>S. rex</i>	Australia	140-147		×	? = <i>S. acuminata</i>
<i>S. rhoda</i>	Australia			×	
<i>S. robsoni</i>	S. Africa	16-37	♂	insufficient	
<i>S. rozella</i>	Australia			×	
<i>S. savignyi</i>	Red Sea; Persian Gulf	27-73	♂ + ♀	×	
<i>S. sewelli</i>	E. Africa	37-238	♀	×	
<i>S. simoniana</i>	S. Africa	64-134	♂ + ♀	×	
<i>S. smithi</i>	Arafura Sea	51	♀	×	
<i>S. subaculeata</i>	Japan		♂ + ♀	×	? = <i>S. lycidas</i>
<i>S. submestus</i>	Australia			×	

Species	Distribution	Depth in metres	Animal Described	Shell Described	Remarks
<i>S. sulcata</i>	Arafura Sea	256	♂		insufficient
<i>S. tenuipes</i>	Japan		♂ + ♀	×	
<i>S. thurstoni</i>	Indian Ocean	22- 37	♂ + ♀	×	
<i>S. tokioensis</i>	Japan		♂	×	
<i>S. treba</i>	Australia			×	? = <i>S. braggi</i>
<i>S. trygonina</i>	Red Sea; Indian Ocean	37-413	♂ + ♀	×	
<i>S. tuberculata</i>	S. Africa		♂ + ♀	×	
<i>S. venustoides</i>	Zanzibar; S. Nilandu Atoll	66	juv.	×	? = <i>S. pharaonis</i>
<i>S. versuta</i>	Australia			×	? = <i>S. braggi</i>
<i>S. whitleyana</i>	E. Australia			×	? = <i>S. elliptica</i>
<i>S. zanzibarica</i>	E. Africa		♂ + ♀	×	
SEPIA (METASEPIA)					
<i>S. pfefferi</i>	Arafura Sea; Australia	51	♀	×	
<i>S. tullbergi</i>	Japan		♂ + ♀	×	
SEPIA (HEMISEPIUS)					
<i>S. dubia</i>	S. Africa		♀	×	
<i>S. typica</i>	S. Africa	2.5-47	♂ + ♀	×	
SEPIELLA					
<i>S. cyanea</i>	S. Africa	37	♂ + ♀	×	
<i>S. inermis</i>	Red Sea; Indian Ocean		♂ + ♀	×	
<i>S. japonica</i>	China; Japan		♂ + ♀	×	
<i>S. melwardi</i>	Australia	? 73		×	
<i>S. ocellata</i>	Java		♂	×	
<i>S. ornata</i>	W. Africa	11-143	♂ + ♀	×	
<i>S. weberi</i>	Timor; Soemba	0-18	♂ + ♀	×	

VI. ALPHABETICAL LIST OF DESCRIBED GENERA AND SUB-GENERA OF SEPIIDAE

Acanthosepion Rochebrune, 1884 (p. 100).

Type species: *Sepia aculeata* Férussac & d'Orbigny, 1835-1848.

Amplisepia Iredale, 1926 (p. 194).

Type species: *Sepia apama* Gray, 1849; original designation.

According to Thiele (1934, p. 954) this genus is a synonym of *Ascarosepion*, but his opinion is based on the erroneous interpretation by Iredale of *Ascarosepion verreauxi* Rochebrune; the latter species has nothing in common with *Sepia apama*.

Andreaesepia Grimpe, 1922 (p. 44).

Type species: *Sepia andreana* Steenstrup, 1875; original designation.

= *Doratossepion* Rochebrune, 1884.

† *Archaeosepia* Szörenyi, 1933 (p. 186).

Type species: † *A. naefi* Szörenyi, 1933.

Arctosepia Iredale, 1926 (p. 193).

Type species: *A. limata* Iredale, 1926; original designation.

Ascarosepion Rochebrune, 1884 (p. 98).

Type species: *A. verreauxi* Rochebrune, 1884 (*non* Iredale, 1926); designated by Hoyle (1910, p. 408).

Synonym: *Solitosepia* Iredale, 1926.

† *Belosepia* Voltz, 1830 (p. 410).

Type species: † *Belosepia cuvieri* Voltz, 1830.

According to Bülow-Trummer (1920, p. 242), the type of *Belosepia* is *B. blainvillei* Desh. and *B. cuvieri* Voltz, a synonym of *B. sepioidea* Blainville.

Blandosepia Iredale, 1940 (p. 442).

Type species: *B. baxteri* Iredale, 1940; original designation.

†*Campylosepia* Picard, 1899 (p. 308).

Type species: †*C. triasica* Picard, 1899.

Crumenasepia Iredale, 1926 (p. 239).

Type species: *C. hulliana* Iredale, 1926; original designation.

Decorisepia Iredale, 1926 (p. 193).

Type species: *D. rex* Iredale, 1926; original designation.

Diphtherosepion Rochebrune, 1884 (p. 79).

Type species: *Sepia ornata* Rang, 1837, designated by Hoyle (1910, p. 408).
= *Sepiella* Gray, 1948.

Doratosepion Rochebrune, 1884 (p. 95).

Type species: *Sepia andreana* Steenstrup, 1875, designated by Hoyle (1910, p. 409).
Synonym: *Andreasepia* Grimpe, 1922.

Eusepia Naef, 1923 (p. 545) (sub-genus).

Type species: *Sepia officinalis* Linné, 1758; original designation.
= *Sepia* Linné, 1758.

Fiscisepia Iredale, 1926 (p. 239) (sub-genus).

Type species: *Acanthosepion ellipticum adjacens* Iredale, 1926; original designation.
= *Platysepia* Naef, 1923.

Glyptosepia Iredale, 1926 (p. 191).

Type species: *G. opipara* Iredale, 1926; original designation.

Hemisepius Steenstrup, 1875 (p. 465).

Type species: *H. typicus* Steenstrup, 1875 (monotypic genus).

Lophosepion Rochebrune, 1884 (p. 90).

Type species: *Sepia lefebvrei* d'Orbigny, 1845.

Mesembrisepia Iredale, 1926 (p. 191).

Type species: *M. macandrewi* Iredale, 1926; original designation.

Metasepia Hoyle, 1885 (p. 199) (sub-genus).

Type species: *M. pfefferi* Hoyle, 1885 (monotypic sub-genus).

Parasepia Naef, 1923 (p. 545) (sub-genus).

Type species: *Sepia orbignyana* Férussac, 1826; original designation.

Platysepia Naef, 1923 (p. 546) (sub-genus).

Type species: *Sepia esculenta* Hoyle, 1885; original designation.
Synonym: *Fiscisepia* Iredale, 1926.

Ponderisepia Iredale, 1926 (p. 239).

Type species: *P. eclogaria* Iredale, 1926; original designation.

†*Pseudosepia* Naef, 1923 (p. 794).

Type species: †*Sepia vera* Deshayes, 1863; original designation.

Rhombosepion Rochebrune, 1884 (p. 82).

Type species: *Sepia rupellaria* Férussac & d'Orbigny, 1835–1848, designated by Hoyle (1910, p. 412).

Sepia Linné, 1758 (p. 658).

Type species: *Sepia officinalis* Linné, 1758, designated by Hoyle (1910, p. 412).¹

According to Bülow-Trummer (1920, p. 246), the author of *Sepia* is Lamarck (1801) and the type: *S. vera* Deshayes, 1863!²

¹ Mayer (1885, p. 23) is in error in citing *S. latimanus* as the type species of *Sepia*; this species was not among the species originally listed by Linnaeus (1758, pp. 658–659).

² Of the species originally listed under *Sepia*, only *S. officinalis* remains, the other species having been removed to other genera.

Sepiella Gray, 1849 (p. 106).

Type species: *Sepia ornata* Rang, 1837, designated by Hoyle (1910, p. 412).

Synonym: *Diphtherosepion* Rochebrune, 1884.

Solitosepia Iredale, 1926 (p. 188).

Type species: *S. liliana* Iredale, 1926; original designation.

= *Ascarosepion* Rochebrune, 1884.

Spathidosepion Rochebrune, 1884 (p. 93).

Type species: *Sepia tuberculata* Lamarck, 1798, designated by Hoyle (1910, p. 413).

† *Stenosepia* Vincent, 1901 (p. 20) (sub-genus of *Belosepia*).

Type species: † *Beloptera compressa* Blainville, 1827.

Tenuisepia Cotton, 1932 (p. 546).

Type species: *T. mira* Cotton, 1932; original designation.

VII. ALPHABETICAL LIST OF SPECIES, SUB-SPECIES AND VARIETIES OF SEPIIDAE¹

† *aalensis* (*Sepialites*), Hehl, 1850, p. 206 = *Geoteuthis bollensis* (v. Zieten 1830, p. 34, pl. XXV, fig. 6) (see *Foss. Cat.* 1, 11, p. 253, 1920).

aculeata (*Sepia*), Férussac & d'Orbigny, 1835-1848, p. 287, pls. 5 *bis*, 25p. 12

acuminata (*Sepia*), Smith, 1916, p. 21, pl. II, figs. 3 & 4p. 53

adhaesa (sub-sp. of *Solitosepia plangon* (Gray)), Iredale, 1926, p. 238p. 42

adjacens (sub-sp. of *Acanthosepion (Fiscisepia) ellipticum* (Hoyle)), Iredale, 1926, p. 239, pl. XXXV, figs. 5 & 6 p. 16

affinis (*Sepia*), Férussac, 1826, p. 156 = ? *Sepioteuthis sepioidea* Blainville, 1823, p. 133 (see d'Orbigny, 1845, p. 300)

affinis (*Sepia*), Eyndoux & Souleyet, 1852, p. 35, pl. 3, figs. 13 & 14 = *Sepiella inermis* (Férussac & d'Orbigny, 1835-1848).p. 124

† *agriensis* (*Sepia*), Wagner, 1938, p. 187, 196, fig. 188

albatrossi (var. of *Sepia kobiensis* Hoyle), Sasaki, 1920, p. 195, pl. 26, figs. 2 & 3.p. 71

andreana (*Sepia*), Steenstrup, 1875, p. 473, pl. I, figs. 11-19p. 75

andreanoides (*Sepia*), Hoyle, 1885, p. 193 = *Sepia kobiensis* Hoyle, 1885p. 71

antillarum (*Sepia*), d'Orbigny, 1838, p. 33 (doubtful species).

† *antiqua* (*Sepia*), Münster, 1837, p. 252 (nomen nudum); 1842, pl. IX, figs. 4 & 5 = *Trachyteuthis antiqua* (see *Foss. Cat.* 1, 11, p. 249, 1920).

apama (*Sepia*), Gray, 1849, p. 103p. 34

appellöfi (*Sepia*), Wülker, 1910, p. 14, figs. 8, 15-18p. 60

arabica (*Sepia*), Massy, 1916, p. 228, pl. XXIII, figs. 1-5; pl. XXIV, fig. 10p. 96

australis (*Sepia*), Quoy & Gaimard, 1832, p. 70, pl. 5, figs. 3-7p. 89

australis (*Sepia*), Férussac & d'Orbigny, 1835, pl. 7, fig. 4 = *Sepia novaehollandiae* Hoyle, 1909p. 48

bandensis (*Sepia*), Adam, 1939, p. 1, figs. 1-4p. 104

bartletti (*Blandosepia*), Iredale, 1954, p. 67, pl. V, figs. 15 & 16.p. 106

baxteri (*Blandosepia*), Iredale, 1940, p. 442p. 105

beppuana (var. of *Sepia kobiensis* Hoyle), Sasaki, 1929, p. 211, fig. 116, pl. XIX, figs. 13-15.p. 71

bertheloti (*Sepia*), d'Orbigny, 1839, p. 21, pl. IIp. 57

† *bertii* (*Sepia*), Foresti, 1890, p. 341, pl. VII (see *Foss. Cat.* 1, 11, p. 246, 1920)

bilineata (*Sepia*), Quoy & Gaimard, 1832, p. 66, pl. 2, fig. 1 = *Sepioteuthis bilineata* (see d'Orbigny, 1845, p. 300).

biserialis (*Sepia*), Blainville, 1827, p. 284 = ? *Sepia elegans* Blainville, 1827p. 94

bisserialis (*Sepia*), Verany, 1851, p. 73, pl. XXVI, figs. f-k = *Sepia elegans* Blainville, 1827p. 94

† *blainvillii* (*Sepia*), Deshayes, 1835, p. 758, pl. 101, figs. 13-15 = *Beloptera sepioidea* Blainville, 1825, p. 622, pl. XI, fig. 7 (see d'Orbigny, 1845, p. 269) = *Belosepia sepioidea* (see *Foss. Cat.* 1, 11, p. 244, 1920).

blainvillei (*Sepia*), Férussac & d'Orbigny, 1848, pl. 21 = *Sepia indica* Férussac & d'Orbigny, 1848, p. 288, pl. 21 = *Sepia aculeata* Férussac & d'Orbigny, 1835-1848.p. 12

boscii (*Sepia*), Lesueur, 1821, p. 101 = *Octopus boscii* (doubtful species).

brachycheira (*Sepia*), Tapparone-Canefri, 1877, p. 278 (doubtful species).

braggi (*Sepia*), Verco, 1907, p. 213, pl. XXVII, fig. 6p. 79

brevimana (*Sepia*), Steenstrup, 1875, pp. 475, 479; 1881, p. 223, pl. I, figs. 24-26p. 5

† *brevispina* (*Sepia*), Sowerby, 1850, p. 193 = *Belosepia brevispina* (see *Foss. Cat.* 1, 11, p. 242, 1920).

burnupi (*Sepia*), Hoyle, 1904, p. 27, pl. I.p. 81

¹ For the fossil species (†) we have only mentioned the names connected with the generic names *Sepia* and *Sepialites*.

- capensis* (*Sepia*), Férussac & d'Orbigny, 1835-1848, p. 278, pl. 7, figs. 1-3, pl. 12, figs. 7-11; pl. 17, figs. 18-19
= *Sepia australis* Quoy & Gaimard, 1832 p. 89
- †*caralitana* (*Sepia*), Gennari, 1867, p. 21 (see *Foss. Cat.* 1, 11, p. 246, 1920).
- cardioptera* (*Sepia*), Oken, 1815, p. 343 = *Onychoteuthis cardioptera* (see d'Orbigny, 1845, p. 300)
= *Onychia carribaea* Lesueur, 1821.
- carinata* (*Sepia*), Sasaki, 1920, p. 192, pl. XXV, fig. 2; pl. XXVI, fig. 1 p. 76
- carunculata* (*Sepia*), Schneider, 1788, p. 42 = *Loligo carunculata* (see d'Orbigny, 1845, p. 300).
- †*caudata* (*Sepia*), Münster, 1837, p. 252 (nomen nudum), d'Orbigny, 1845 (Pal. univ.), pl. V, figs. 1-3
= *Trachyteuthis caudata* (see *Foss. Cat.* 1, 11, p. 249, 1920).
- chirotrema* (*Sepia*), Berry, 1918, p. 268, pl. LXXIV, figs. 3-9, pl. LXXV-LXXVII, text-figs. 57-61 p. 51
- chrysophtalmos* (*Sepia*), Tilesius, 1813, pl. 38 (88?), figs. 32 & 33 = *Loligopsis chrysophtalmos* (see d'Orbigny, 1845, p. 300).
- chuni* (var. of *Hemisepius typicus* Steenstrup), Thore, 1945, p. 50 p. 118
- cirrhusa* (*Sepia*), Bosc, 1802, p. 47 = *Eledone cirrhosa* (see d'Orbigny, 1845, p. 300).
- †*complanata* (*Sepia*), Bellardi, 1872, p. 18, pl. II, fig. 6 (see *Foss. Cat.* 1, 11, p. 247, 1920).
- †*compressa* (*Sepia*), d'Orbigny, 1845, p. 271 = *Beloptera compressa* Blainville, 1827, p. 110, pl. IV, fig. 10
= *Belosepia (Stenosepia) compressa* (see *Foss. Cat.* 1, 11, p. 246, 1920).
- confusa* (*Sepia*), Smith, 1916, p. 24, pl. II, figs. 7 & 8 p. 65
- cottesloensis* (*Decorisepia*), Cotton, 1929, p. 90, pl. XVI, figs. 1 & 2 p. 56
- crassa* (var. of *Sepia kubiensis* Hoyle), Sasaki, 1929, p. 213, pl. XIX, figs. 16-18 p. 71
- cultrata* (*Sepia*), Hoyle, 1885, p. 198 p. 58
- curta* (*Sepiella*), Pfeffer, 1884, p. 13, figs. 16, 16a = *Sepiella inermis* (Férussac & d'Orbigny, 1835-1848) p. 124
- †*cuspidata* (*Sepia*), Simpson, 1855, p. 21 = *Teudopsis cuspidata* (see *Foss. Cat.* 1, 11, p. 258, 1920).
- †*cuvieri* (*Sepia*), d'Orbigny, 1824, p. 482 = *Belosepia cuvieri* (see *Foss. Cat.* 1, 11, p. 243, 1920).
- †*cuvieri* (*Sepia*), Deshayes, 1835, p. 758, pl. 101, figs. 7 & 8 = *Sepia oweni* Sowerby, 1829, p. 183 = *Belosepia oweni* (see *Foss. Cat.* 1, 11, p. 243, 1920).
- †*cuvieri* (*Sepia*), Galeotti (pars), 1837, p. 140 = *Belosepia proxima* Vincent, 1901, p. 14 (see *Foss. Cat.* 1, 11, p. 244, 1920).
- cyanea* (*Sepiella*), Robson, 1924, p. 13 p. 121
- dabryi* (*Diphtherosepion*), Rochebrune, 1884, p. 81 = *Sepiella japonica* Sasaki, 1929 p. 128
- dannevigi* (*Sepia*), Berry, 1918, p. 264, figs. 51-55, pl. LXXIII, LXXIV, figs. 1 & 2 p. 48
- †*defrancii* (*Sepia*), Deshayes, 1835, p. 759, pl. 101, figs. 1-3 = *Belosepia (Stenosepia) compressa* Blainville, 1827 (see *Foss. Cat.* 1, 11, p. 246, 1920).
- dollfusi* (*Sepia*), Adam, 1941, p. 12, pl. II, fig. 3 p. 98
- dubia* (*Sepia (Hemisepius)*) sp. nov. p. 119
- dunensis* (*Sepia*), Chenu, 1859, p. 45, fig. 138 = *Palaeoteuthis dunensis* Roemer, 1856, p. 74, pl. XIII (see *Foss. Cat.* 1, 11, p. 271, 1920).
- eclogaria* (*Ponderisepia*), Iredale, 1926, p. 239, pl. XXXV, figs. 7 & 8 = *Sepia latimanus* Quoy & Gaimard, 1832 . p. 33
- elegans* (*Sepia*), Blainville, 1827, p. 284 p. 94
- elliptica* (*Sepia*), Hoyle, 1885, p. 189 p. 14
- elobyana* (*Sepia*), Adam, 1941, p. 121, fig. 12, pl. III, fig. 5 p. 103
- elongata* (*Sepia*), d'Orbigny, 1845, p. 289, pl. 13, figs. 7-10 p. 86
- elongata* (*Sepia*), Tate & May, 1901, p. 351 = *Sepia braggi* Verco, 1907 p. 79
- enoplon* (*Acanthosepion*), Rochebrune, 1884, p. 108 = *Sepia orbignyana* Férussac, 1826. p. 87
- †*ensifformis* (*Sepia*), Chenu, 1859, p. 45, fig. 133 = *Trachyteuthis ensiformis* (pars) v. Meyer, 1856, p. 108, pl. XIX, fig. 2 = *Trachyteuthis caudata* Münster, 1837 (see *Foss. Cat.* 1, 11, p. 249, 1920).
- erostrata* (*Sepia*), Sasaki, 1929, 183, pl. XVII, figs. 7-9 p. 75
- esculenta* (*Sepia*), Hoyle, 1885, p. 188 p. 18
- exsignata* (*Sepia*), Barnard, 1962, p. 250, fig. 3 p. 83
- filliouxii* (sub.-sp. of *Sepia officinalis* Linné), Lafont, 1868, No. 81, 1869, p. 11 p. 32
- fischeri* (*Sepia*), Lafont, 1871, p. 271 = ? *Sepia filliouxii* Lafont, 1868 (see Cuénot, 1927, p. 273) .
- formosana* (*Sepia*), Berry, 1912, p. 420, pl. IX, fig. 7, text-fig. 2 = *Sepia pharaonis* Ehrenberg, 1831 p. 22
- foxi* (var. of *Ascarosepion singhalensis* (Goodrich)), Robson, 1927, p. 325 = *Sepia pharaonis* Ehrenberg, 1831 p. 22
- framea* (*Sepia*), Ortmann, 1891, p. 675, pl. XLVI, fig. 2 = *Sepia pharaonis* Ehrenberg, 1831. p. 22
- †*gaillardoti* (*Sepia*), Keferstein, 1834, p. 551 = *Conchorhynchus gaillardoti* (see d'Orbigny, 1845, p. 300)
= *Conchorhynchus avirostris* (Schlotheim, 1820, p. 169, pl. 29, fig. 10), (see d'Orbigny, 1845, p. 590).
- galei* (*Sepia*), Meyer, 1909, p. 332, figs. 4-6 p. 40

- †*gastaldi* (*Sepia*), Bellardi, 1872, p. 14, pl. I, fig. 3 (see *Foss. Cat.* 1, 11, p. 247, 1920).
- gemellus* (*Glyptosepia*), Iredale, 1926, p. 192, pl. XXII, figs. 1 & 2p. 60
- genista* (*Solitosepia*), Iredale, 1954, p. 66, pl. V, figs. 17 & 18p. 40
- gibba* (*Sepia*), Ehrenberg, 1831, No. 2.p. 100
- gibbosa* (*Sepia*), Orbigny, 1845, p. 287 = *Sepia gibba* Ehrenberg, 1831p. 100
- †*gigantea* (*Sepia*), Keferstein, 1834, p. 551 = *Nautilus giganteus* (see d'Orbigny, 1845, p. 300).
- gigas* (*Sepia*), Oken, 1815, p. 344 = "*Poulpe colossal*" (see d'Orbigny, 1845, p. 300).
- glauerti* (*Solitosepia*), Cotton, 1929, p. 87, pl. XIV, figs. 3 & 4p. 47
- goreense* (*Acanthosepion*), Rochebrune, 1884, p. 109 = *Sepia officinalis hierredda* Rang, 1837 (see Adam, 1941, p. 107).
- †*gracilis* (*Sepia*), Münster, 1837, p. 252 (nomen nudum); Férussac & d'Orbigny, 1848, pl. XVI, fig. 5 = *Sepia linguata* Münster, 1837 (see d'Orbigny, 1845, p. 268) = *Trachyteuthis linguata* (see *Foss. Cat.* 1, 11, p. 250, 1920).
- †*gracilis* (*Sepialites*), Münster, 1843, p. 77, pl. XIV, fig. 5 = *Beloteuthis schübleri* v. Zieten, 1830, pl. XXXVII, fig. 1 (see *Foss. Cat.* 1, 11, p. 260, 1920).
- †*granosa* (*Sepia*), Bellardi, 1872, p. 16, pl. II, fig. 2 (see *Foss. Cat.* 1, 11, p. 247, 1920).
- granulata* (*Sepia*), Bosc, 1802, p. 47 = *Octopus rugosus* Bosc, 1792 (see d'Orbigny, 1845, p. 300)¹
- †*graversii* (*Sepia*), Gastaldi, 1868, p. 226, pl. IV. (see *Foss. Cat.* 1, 11, p. 247, 1920).
- gröenlandica* (*Sepia*), Dewhirst, 1834, p. 263 = ? *Bathypolypus arcticus* (Prosch, 1849).
- †*harmati* (*Sepia*), Szörenyi, 1933, p. 184, pl. I, figs. 4-6, 10.
- harmeri* (*Sepia*), Robson, 1928, p. 8, figs. 2 & 3 = *Sepia latimanus* Quoy & Gaimard, 1832.p. 33
- hasselti* (*Acanthosepion*), Rochebrune, 1884, p. 101 = *Sepia aculeata* Férussac & d'Orbigny, 1835-1848p. 12
- †*hastiformis* (*Sepia*), Rüppell, 1829, p. 9, pl. 3, fig. 2 = *Trachyteuthis hastiformis* (see *Foss. Cat.* 1, 11, p. 249, 1920).
- †*haustrium* (*Sepia*), Simpson, 1855, p. 21 = *Geoteuthis coriacea* Quenstedt, 1846-1849, p. 412, pl. XXXIV, figs. 5 & 6 (see *Foss. Cat.* 1, 11, p. 254, 1920).
- hedleyi* (*Sepia*), Berry, 1918, p. 258, figs. 48-50, pls. LXXI-LXXIIp. 60
- hendryae* (*Solitosepia*), Cotton, 1929, p. 87, pl. XV, figs. 1 & 2p. 60
- hercules* (*Sepia*), Pilsbry, 1894, p. 144 = *Sepia latimanus* Quoy & Gaimard, 1832p. 33
- hexapus* (*Sepia*), Molina, p. 175 = "*insecte*" (see d'Orbigny, 1845, p. 300).
- heylei* (*Sepiella*), Sasaki, 1929, p. 221, fig. 170 = *Sepiella japonica* Sasaki, 1929p. 128
- hieronis* (*Rhombosepion*), Robson, 1924, p. 645, pl. II, figs. 9-11p. 112
- hierredda* (*Sepia*), Rang, 1837, p. 75, pl. 100 = *Sepia officinalis hierredda*p. 31
- †*hirundo* (*Sepia*), Keferstein, 1834, p. 551 = *Nautilus hirundo* (see d'Orbigny, 1845, p. 300).
- hoylei* (*Sepia*), Ortmann, 1888, p. 650, pl. XXII, fig. 5a-c, pl. XXIII, fig. 1a-c = *Sepia esculenta* Hoyle, 1885.p. 18
- hulliana* (*Crumenasopia*), Iredale, 1926, p. 239, pl. XXXV, figs. 1 & 2 = *Sepia pharaonis* Ehrenberg, 1831p. 22
- †*hungarica* (*Sepia*), Lörenthey, 1898, p. 268, pl. III (see *Foss. Cat.*, 1, 11, p. 247, 1920).
- incerta* (*Sepia*), Smith, 1916, p. 23, pl. II, fig. 6p. 67
- indica* (*Sepia*), Férussac & d'Orbigny, 1848, p. 288, pl. 21 = *Sepia aculeata* Férussac & d'Orbigny, 1835-1848.p. 12
- inermis* (*Sepia*), Férussac & d'Orbigny, 1835-1848, p. 286, pl. 6 bis., pl. 20, figs. 1-9 = *Sepiella inermis*p. 123
- insignis* (*Sepia*), Smith, 1916, p. 25, pl. II, fig. 10p. 114
- irvingi* (*Sepia*), Meyer, 1909, p. 333, figs. 7-10p. 51
- †*fisseli* (*Sepia*), Bellardi, 1872, p. 19, pl. II, fig. 7 (see *Foss. Cat.* 1, 11, p. 247, 1920).
- italica* (*Sepia*), Risso, 1854, p. 13, pl. V, figs. 1 & 2 = *Sepia elegans* Blainville, 1827.p. 94
- jaenschi* (*Decorisepia*), Cotton, 1931, p. 41, figs. 5 & 6p. 55
- japonica* (*Sepiella*), Sasaki, 1929, p. 219, fig. 170, pl. XVIII, figs. 20-23; pl. XIX, fig. 28p. 128
- javanicum* (*Acanthosepion*), Rochebrune, 1884, p. 110 = *Sepia aculeata* Férussac & d'Orbigny, 1835-1848p. 12
- joubini* (*Sepia*), Massy, 1927, p. 161, pl. XVIIIp. 70
- jousseaumi* (*Sepia*), Rochebrune, 1884, p. 117 = *Sepia officinalis vermiculata* Quoy & Gaimard, 1832p. 30
- jurujubai* (var. of *Sepia officinalis* Linné), Oliveira, 1940, p. 29 = *Sepioteuthis sepioidea* Blainville, 1823, p. 133
- kiensis* (*Sepia*), Hoyle, 1885, p. 194p. 78
- †*kiscellensis* (*Sepia*), Wagner, 1938, pp. 183, 194, fig. 2
- kobiensis* (*Sepia*), Hoyle, 1885, p. 195.p. 71
- koettlitzii* (*Sepia*), Hoyle, 1901, p. 1, pl. I = *Sepia pharaonis* Ehrenberg, 1831p. 22

¹ d'Orbigny mentions "*Sepia granulosa*" Bosc.

- lana* (*Solitosepia*), Iredale, 1954, p. 66p. 40
- †*larus* (*Sepia*), Keferstein, 1834, p. 551 = *Rhynchoteuthis larus* (see d'Orbigny, 1845, pp. 300, 596)
- latimanus* (*Sepia*), Quoy & Gaimard, 1832, p. 68, pl. 2, figs. 2-11p. 33
- laxior* (sub-sp. of *Metasepia pfefferi* (Hoyle)), Iredale, 1926, p. 240, pl. XXXV, figs. 9 & 10.p. 116
- lefebvrei* (*Sepia*), d'Orbigny, 1845, p. 288, pl. 13, figs. 5 & 6 = *Sepia gibba* Ehrenberg, 1831p. 100
- liliana* (*Solitosepia*), Iredale, 1926, p. 188, pl. XXI, figs. 1-3p. 47
- limata* (*Arctosepia*), Iredale, 1926, p. 193, pl. XXIII, figs. 7 & 8p. 80
- †*linguata* (*Sepia*), Münster, 1837, p. 252 (nomen nudum); d'Orbigny, 1845 (Pal. univ.), p. 162, pl. VI, figs. 4-6
= *Trachyteuthis linguata* (see Foss. Cat. I, 11, p. 250, 1920).
- loligo* (*Sepia*), Linné, 1758, p. 659; 1767, p. 1096 = *Loligo vulgaris* Lamarck, 1798.
- loligo* (*Sepia*), Gmelin, 1789, p. 3150 = *Todarodes sagittatus* Lamarck, 1799 (see d'Orbigny, 1845, p. 300).
- lorigo* (*Sepia*), Fabricius, 1780, p. 359 = *Onychoteuthis banksii* (Leach, 1817) (see d'Orbigny, 1845, p. 300)
= *Gonatus fabricii* (Lichtenstein, 1818) (see Hoyle, 1886a, p. 252).
- longipes* (*Sepia*), Sasaki, 1914, p. 619, pl. XII, figs. 4 & 5p. 69
- †*longirostris* (*Sepia*), Deshayes, 1835, p. 757, pl. 101, figs. 10-12 = *Beloptera sepioidea* Blainville, 1825, p. 621, pl. XI,
fig. 7 (see d'Orbigny, 1845, p. 269) = *Belosepia sepioidea* (see Foss. Cat. I, 11, p. 244, 1920).
- †*longispina* (*Sepia*), Deshayes, 1835, p. 757, pl. 101, figs. 4-6 = *Beloptera sepioidea* Blainville, 1825, p. 621, pl. XI,
fig. 7 (see d'Orbigny, 1845, p. 269) = *Belosepia sepioidea* (see Foss. Cat. I, 11, p. 244, 1920).
- †*lörrentheyi* (*Sepia*), Kretzoi, 1942, p. 124; nom. nov. for *Sepia mediterranea* Lörrenthey, 1911 (*non* Ninni, 1884)
- lorigera* (*Sepia*), Wülker, 1910, p. 12, figs. 3, 4, 11-14p. 69
- †*lovisatoi* (*Sepia*), Parona, 1892, p. 5, pl. III, figs. 3-5 (see Foss. Cat. I, 11, p. 247, 1920).
- lutea* (var. of *Sepia officinalis* Linné), Risso, 1854, p. 11 (nomen nudum)
- lycidas* (*Sepia*), Gray, 1849, p. 103p. 8
- macandrewi* (*Mesembrisepia*), Iredale, 1926, p. 191, pl. XXI, figs. 8 & 9p. 48
- macilentia* (*Glyptosepia*), Iredale, 1926, p. 192, pl. XXII, figs. 3 & 4 = ? *Sepia cultrata* Hoyle, 1885 (see Iredale, 1955, p. 79).p. 59
- madokai* (*Sepia*), Adam, 1939, p. 77; nom. nov. for *Sepia robsoni* Sasaki, 1929 (*non* Massy, 1927)p. 56
- maindroni* (*Sepiella*), Rochebrune, 1884, p. 89 = *Sepiella inermis* (Férussac & d'Orbigny, 1835-1848).p. 124
- mammilata* (*Sepia*), Férussac & d'Orbigny, 1835-1848, p. 277 (*S. mamillata*), pl. IV bis (*S. mammilata*) = ? *Sepia tuberculata* Lamarck, 1798p. 106
- martini* (*Diphtherosepion*), Rochebrune, 1884, p. 81 = *Sepiella inermis* (Férussac & d'Orbigny, 1835-1848)p. 124
- media* (*Sepia*), Linné, 1758, p. 659; 1767, p. 1095 = *Alloteuthis media* (see d'Orbigny, 1845, p. 301).
- media* (*Sepia*), Barbut, 1788, p. 75, pl. VIII, fig. 3 = *Todarodes sagittatus* (see d'Orbigny, 1845, p. 301).
- mediterranea* (sub-sp. of *Sepia officinalis* Linné), Ninni, 1884, p. 159.
- †*mediterranea* (*Sepia*), Lörrenthey, 1909-1913, p. 406 (*non* Ninni, 1884) = *Sepia lörrentheyi* Kretzoi, 1942.
- melwardi* (*Sepiella*), Iredale, 1954, p. 78, pl. V, figs. 1-6p. 127
- mercatoris* (*Sepia*), Adam, 1937, p. 56, figs. 6-10 = *Sepia bertheloti* Orbigny, 1839p. 57
- mestus* (*Sepia*), Gray, 1849, p. 108p. 45
- †*micheelotti* (*Sepia*), Gastaldi, 1868, p. 226, pl. 5 (see Foss. Cat. I, 11, p. 247, 1920).
- microcheirus* (*Sepia* (*Sepiella*)), Gray, 1849, p. 107 = *Sepiella inermis* (Férussac & d'Orbigny, 1835-1848)p. 124
- microcotyledon* (*Sepia*), Ortman, 1891, p. 673, pl. XLVI, fig. 1 = *Sepia aculeata* Férussac & d'Orbigny, 1835-1848p. 127
- minima* (*Sepia*), Lesueur, 1821, p. 100 (nomen nudum) = *Sepia sepiola* Péron (*non* Linné) = ?
- minor* (*Sepia*), Seba, 1758, pl. III, figs. 5 & 6 = *Todarodes sagittatus* (see d'Orbigny, 1845, p. 300).
- mira* (*Tenuisepia*), Cotton, 1932, p. 546, figs. 7-9p. 87
- misakiensis* (*Sepia*), Wülker, 1910, p. 15, figs. 5, 6, 19-22p. 76
- moschata* (*Sepia*), Bosc, 1802, p. 48 = *Eledone moschata* Lamarck, 1798.
- moschites* (*Sepia*), Herbst, 1788, p. 80 = *Eledone cirrhosa* (Bosc, 1802) (see d'Orbigny, 1845, p. 301).
- mozambica* (*Sepia*), Rochebrune, 1884, p. 118 = ? *Sepia latimanus* Quoy & Gaimard, 1832p. 33
- mucronata* (*Sepia*), Rafinesque, 1814, p. 29 (nomen nudum).
- murrayi* (*Sepia*), sp. nov.p. 63
- myrsus* (*Sepia*), Gray, 1849, p. 108p. 112
- natalensis* (*Sepia*), Massy, 1925, p. 212, pl. XI, figs. 1-11, pl. XIV, fig. 37 = *Sepia simoniana* Thiele, 1921p. 109
- nigra* (*Sepia*), Bosc, 1802, p. 47 = ? *Dosidicus gigas* (d'Orbigny, 1835) (see d'Orbigny, 1845, p. 301).
- novaehollandiae* (*Sepia*), Hoyle, 1909, p. 266; nom. nov. for *Sepia australis* Férussac & d'Orbigny, 1835-1848
(*non* Quoy & Gaimard, 1832)p. 48
- †*obscura* (*Sepia*), Münster, 1837, p. 252 (nomen nudum); 1842, pl. IX, fig. 3 = *Trachyteuthis antiqua* (Münster, 1842) (see Foss. Cat., I, 11, p. 249, 1920).
- obtusata* (*Sepiella*), Pfeffer, 1884, p. 15, figs. 19 & 19a = ? *Sepiella japonica* Sasaki, 1929p. 128

- †*obtusialis* (*Sepia*), Simpson, 1855, p. 20 = *Geoteuthis coriacea* Quenstedt, 1846-1849, p. 412, pl. XXXIV, figs. 5 & 6 (see *Foss. Cat.* 1, 11, p. 253, 1920).
- occidua* (*Solitosepia*), Cotton, 1929, p. 88, pl. XIV, figs. 1 & 2 p. 40
- ocellata* (*Sepiella*), Pfeffer, 1884, p. 13, figs. 17 & 17a-b p. 127
- octopa* (*Sepia*), Péron in Lesueur, 1821, p. 101 = *Sepia peronii* Lesueur = *Octopus pustulosus*¹ Blainville, 1826, p. 186 (see d'Orbigny, 1845, p. 301).
- octopodia* (*Sepia*), Linné, 1758, p. 658 = *Octopus vulgaris* Cuvier, 1797 (see d'Orbigny, 1845, p. 301) = *Octopus* and *Eledone* (see Robson, 1929, p. 62).
- octopodia* (*Sepia*), Pennant, 1776, p. 53, pl. XXVIII, fig. 44 = *Eledone cirrhosa* Lamarck, 1798 (see d'Orbigny, 1845, p. 301).
- octopus* (*Sepia*), Gmelin, 1791, p. 3149 = *Octopus vulgaris* Cuvier, 1797 (see d'Orbigny, 1845, p. 301).
- octopus* (*Sepia*), Molina, 1789, p. 173 = *Octopus fontanianus* d'Orbigny, 1835 (see d'Orbigny, 1845, p. 301).
- oculifera* (*Acanthosepion*), Rochebrune, 1884, p. 107 = *Sepia officinalis hierreda* Rang, 1837 (animal) and *Sepia prashadi* Winckworth, 1936 (shell). p. 26
- officinalis* (*Sepia*), Linné, 1758, p. 658 p. 30
- †*oligocaenica* (*Sepia*), Szörenyi, 1933, p. 184, pl. I, figs. 8 & 9
- omani* (*Sepia*) sp. nov. p. 92
- opipara* (*Glyptosepia*), Iredale, 1926, p. 191, pl. XXII, figs. 7 & 8 p. 60
- orbigniana* (*Sepia*), Férussac (in d'Orbigny), 1826, p. 156 p. 87
- †*d'orbignyi* (*Sepia*), Keferstein, 1834, p. 551 = *Rhynchoteuthis larus* (Keferstein, 1834) (see d'Orbigny, 1845, pp. 301, 596).
- ornata* (*Sepia*), Rang, 1837, p. 76, pl. 101 = *Sepiella ornata* p. 127
- †*ornata*² (*Sepia*), d'Orbigny, 1845 (Pal. univ.) p. 166, pl. III, fig. 12, pl. IV, figs. 1-3 = *Glyphiteuthis ornata* (see *Foss. Cat.* 1, 11, p. 251, 1920).
- ostanes* (*Mesembrisepia*), Iredale, 1954, p. 69, pl. IV, figs. 5 & 6 p. 52
- ovata* (*Sepiella*), Pfeffer, 1884, p. 14, figs. 18 & 18a = ? *Sepiella japonica* Sasaki, 1929 p. 128
- †*oweni* (*Sepia*), Sowerby, 1829, p. 183 = *Belosepia oweni* (see *Foss. Cat.* 1, 11, p. 243, 1920).
- pagenstecheri* (*Sepia*), Pfeffer, 1884, p. 9, figs. 12, 12a = ? *Sepia recurvirostra* Steenstrup, 1875 p. 28
- pageorum* (*Acanthosepion*) Iredale, 1954, p. 76, pl. IV, figs. 7-9 p. 20
- palmata* (*Sepia*), Owen, 1881, p. 134, pl. XXIV, XXV = ? *Sepia apama* Gray, 1849 p. 34
- papillata* (*Sepia*), Quoy & Gaimard, 1832, p. 61, pl. I, figs. 6-14 p. 108
- papuensis* (*Sepia*), Hoyle, 1885, p. 197 p. 38
- pardalis* (*Sepia*), Sasaki, 1914, p. 614, pl. XII, figs. 1-3 p. 67
- †*parisiensis* (*Sepia*), d'Orbigny, 1826, p. 157 = *Beloptera belemnitoidea* Deshayes, 1835, p. 762, pl. 100, figs. 4-6 (see *Foss. Cat.* 1, 11, p. 235, 1920).
- parysatis* (*Amplisepia*), Iredale, 1954, p. 71, pl. IV, figs. 1 & 2 p. 38
- pelagica* (*Sepia*), Bosc, 1802, p. 46, pl. I, figs. 1 & 2 = *Hyaloteuthis pelagicus* (see d'Orbigny, 1845, p. 301).
- peregrina* (sub-sp. of *Solitosepia rozella* Iredale), Iredale, 1926, p. 238 p. 47
- peronii* (*Sepia*), Lesueur, 1821, p. 101 (nomen nudum) = *Sepia octopa* Péron (*non* Linné) = *Octopus pustulosus*³ Blainville, 1826, p. 186 (see d'Orbigny, 1845, p. 301).
- peterseni* (*Sepia*), Appellöf, 1886, p. 23, pl. II, figs. 1-6; pl. III, fig. 21. p. 75
- pfefferi* (*Sepia* (*Metasepia*)), Hoyle, 1885, p. 199 p. 114
- pharaonis* (*Sepia*), Ehrenberg, 1831 p. 22
- plangon* (*Sepia*), Gray, 1849, p. 104 p. 42
- polynesica* (*Sepia*), Pfeffer, 1884, p. 11, figs. 14 & 14a = ? *Sepia plangon* Gray, 1849. p. 44
- prashadi* (*Sepia*), Winckworth, 1936, p. 17, pl. 4. p. 26
- prionota* (*Sepia*), Voss, 1926, p. 169 = *Sepia papuensis* Hoyle, 1885. p. 41
- †*prisca* (*Sepia*), König, 1825, pl. XVII, fig. 201 (see *Foss. Cat.* 1, 11, p. 267, 1920).
- rappiana* (*Sepia*), Férussac & d'Orbigny, 1835, pl. 10 = *Sepia latimanus* Quoy & Gaimard, 1832 p. 33
- recurvirostra* (*Sepia*), Steenstrup, 1875, pp. 475, 479 p. 28
- †*regularis* (*Sepia*), Münster, 1837, p. 252 (nomen nudum); Férussac & d'Orbigny, 1848, pl. 15, fig. 4 = *Sepia linguata* Münster, 1837 (see d'Orbigny, 1845, p. 268) = *Trachyteuthis linguata* (see *Foss. Cat.* 1, 11, pp. 250, 1920).
- †*regulosa* (*Sepia*), Bellardi, 1872, p. 15, pl. II, fig. 1 (see *Foss. Cat.* 1, 11, p. 247, 1920).
- rex* (*Decorisepia*), Iredale, 1926, p. 193, pl. XXIII, figs. 9 & 10 p. 56

¹ d'Orbigny mentions "*Octopus pustulatus*".² This name being preoccupied, it may be replaced by *ornatoides* nom. nov.³ d'Orbigny mentions "*Octopus pustulatus*".

- rhoda* (*Arctosepia*), Iredale, 1954, p. 75, pl. IV, figs. 10-12 p. 81
- robsoni* (*Rhombosepion*), Massy, 1927, p. 159, pl. XVII p. 120
- robsoni* (*Sepia*), Sasaki, 1929 (*non* Massy, 1927), p. 179, pl. XVII, figs. 2 & 3 = *Sepia madokai* Adam, 1939. p. 56
- rostrata* (*Sepia*), Férussac & d'Orbigny, 1835, pl. 8, fig. 6 p. 56
- rostrum* (*Sepia*), Férussac & d'Orbigny, 1848 (*non* 1835), p. 284, pl. 26 = *Sepia brevimana* Steenstrup, 1875 p. 5
- rostrum* (*Sepia*), Hisinger, 1837, = "*Pollicipes*" (see d'Orbigny, 1845, p. 301).
- rouxii* (*Sepia*), Férussac & d'Orbigny, 1848, p. 271, pl. 19 = *Sepia pharaonis* Ehrenberg, 1831 p. 22
- rozella* (*Solitosepia*), Iredale, 1926, p. 190, pl. XXI, figs. 6 & 7 p. 47
- rubens* (*Sepia*), Philippi, 1844, p. 203 = *Sepia orbignyana* Férussac, 1826. p. 87
- rupellaria* (*Sepia*), Férussac & d'Orbigny, 1835-1848, p. 274, pl. 3, figs. 10-13 = *Sepia elegans* Blainville, 1827 p. 94
- rugosa* (*Sepia*), Bosc, 1792, p. 24, pl. 5, figs. 1 & 2 = *Octopus rugosus* (see d'Orbigny, 1845, p. 301).
- rugosa* (*Sepia*), Bowdich, 1822, pl. I, fig. 1 = *Sepia officinalis* Linné (see d'Orbigny, 1845, p. 272).
- †*saccoi* (*Sepia*), Lipparini, 1934, p. 7, pl. V, fig. 2a-b.
- sagamiana* (var. of *Sepia kubiensis* Hoyle), Sasaki, 1929, figs. 112-114 = *Sepia kubiensis* var. *andreanoides* Hoyle, 1885 p. 71
- savignyi* (*Sepia*), Blainville, 1827, p. 285 p. 70
- †*sepioidea* (*Sepia*) (Blainville, 1825, pars), d'Orbigny, 1845 (Pal. univ.), p. 164, pl. VIII, figs. 4-8; Férussac & d'Orbigny, 1848, p. 293, pl. 14, figs. 7-12; pl. 16, figs. 7-9 = *Beloptera sepioidea* Blainville, 1825, p. 622, pl. XI, fig. 7 = *Belosepia sepioidea* (see *Foss. Cat.* 1, 11, p. 244, 1920).
- †*sepioidea* (*Sepia*) (Blainville, 1825, pars), Férussac & d'Orbigny, 1835, pl. 3, fig. 5 = *Belosepia cuvieri* (d'Orbigny, 1824) (see *Foss. Cat.* 1, 11, p. 243, 1920).
- †*sepioidea* (*Sepia*), Nyst, 1834, p. 610 = *Belosepia oweni* (Sowerby, 1829) (see *Foss. Cat.* 1, 11, p. 243, 1920).
- sepiola* (*Sepia*), Linné, 1758, p. 659; Gmelin, 1791, p. 1096 = *Sepiola rondeletii* Leach, 1817, p. 140 (see d'Orbigny, 1845, p. 301).
- sepiola* (*Sepia*), Lesueur, 1821, p. 100 = *Loligopsis peronii* Lamarck, 1812, p. 123 (see d'Orbigny, 1845, p. 301).
- †*sepulata* (*Sepia*), (Michelotti) Bellardi, 1872, p. 17, pl. II, fig. 5 (see *Foss. Cat.* 1, 11, p. 248, 1920).
- sewelli* (*Sepia*), sp. nov. p. 61
- simoniana* (*Sepia*), Thiele, 1921, p. 436, pl. LII, figs. 5-13 p. 109
- sinensis* (*Sepia*), Férussac & d'Orbigny, 1835-1848, p. 289, pl. 9, figs. 1 & 2 = ? *Sepiella japonica* Sasaki, 1929 p. 128
- singalensis* (*Sepia*), Goodrich, 1896, p. 3, pl. I, figs. 4-8 = *Sepia pharaonis* Ehrenberg, 1831. p. 22
- singaporensis* (*Sepia*), Pfeffer, 1884, p. 10, figs. 13 & 13a = *Sepia recurvirostra* Steenstrup, 1875 p. 28
- sinope* (*Sepia*), Gray, 1849, p. 106 = ? *Sepia australis* Quoy & Gaimard, 1832 p. 89
- smithi* (*Sepia*), Hoyle, 1885, p. 190 p. 19
- spinigerum* (*Acanthosepion*), Rochebrune, 1884, p. 103 = (pars) *Sepia rostrata* Férussac & d'Orbigny, 1835, pl. 8 fig. 6 and (pars) *Sepia brevimana* Steenstrup, 1875. p. 5
- †*striatulus* (*Sepialites*), Quenstedt, 1846-1849, p. 515, pl. XXXVI, fig. 20 = *Geoteuthis bollensis* (v. Zieten, 1830, p. 34, pl. XXV, fig. 6) (see *Foss. Cat.* 1, 11, p. 253, 1920).
- †*striatus* (*Sepialites*), Münster, 1843, p. 76, pl. VI, fig. 6 = *Geoteuthis bollensis* (v. Zieten, 1830, p. 34, pl. XXV, fig. 6) (see *Foss. Cat.* 1, 11, p. 253, 1920).
- †*stricta* (*Sepia*), Bellardi, 1872, p. 17, pl. II, fig. 5 (see *Foss. Cat.* 1, 11, p. 248, 1920).
- subaculeata* (*Sepia*), Sasaki, 1914, p. 609, pl. XII, figs. 6 & 7 = ? *Sepia lycidas* Gray, 1849 p. 10
- submestus* (*Solitosepia*), Iredale, 1926, p. 238, pl. XXXV, figs. 3 & 4 p. 40
- †*subsagittata* (*Sepia*), Wagner, 1860, p. 764 (see *Foss. Cat.* 1, 11, p. 248, 1920).
- subulata* (*Sepia*), Bosc, 1802, p. 46 = ? *Alloteuthis subulata* (Lamarck, 1799).
- sulcata* (*Sepia*), Hoyle, 1885, p. 192 p. 91
- tenuipes* (*Sepia*), Sasaki, 1929, p. 193, pl. XVIII, figs. 1-9 p. 74
- thurstoni* (*Sepia*), sp. nov. p. 2
- tigris* (*Sepia*), Sasaki, 1929, p. 168, pl. XXVIII, figs. 13-16, text-fig. 167 = *Sepia pharaonis* Ehrenberg, 1831 p. 22
- tokioensis* (*Sepia*), Ortmann, 1888, p. 653, pl. XXIII, fig. 3 p. 76
- torosa* (*Sepia*), Ortmann, 1888, p. 652, pl. XXIII, fig. 2 = *Sepia pharaonis* Ehrenberg, 1831 p. 22
- tourannensis* (*Sepia*), Eydoux & Souleyet, 1852, p. 33, pl. 3, figs. 6-12 = *Sepiella inermis* (Férussac & d'Orbigny, 1835-1848) p. 124
- toyamensis* (var. of *Sepia kubiensis* Hoyle), Sasaki, 1929, p. 209, pl. XIX, figs. 8-12, text-fig. 115 p. 71
- treba* (*Arctosepia*), Iredale, 1954, p. 75 p. 81
- trygoninum* (*Doratosepion*), Rochebrune, 1884, p. 97 p. 84
- tuberculata* (*Sepia*), Lamarck, 1798, p. 130; 1799, p. 9, pl. I, fig. 1a-b p. 106
- tullbergi* (*Sepia*), Appellöf, 1886, p. 26, pl. II, figs. 7-14 p. 116
- tunicata* (*Sepia*), Molina, 1789, p. 173 = *Dosidicus gigas* (d'Orbigny, 1835) (see d'Orbigny, 1845, p. 301).
- typicus* (*Hemisepius*), Steenstrup, 1875, p. 465, pl. I, figs. 1-10; pl. II, fig. 1. p. 117

- unguiculata* (*Sepia*), Molina, 1789, p. 199 = *Cuciotheuthis unguiculatus* (see Steenstrup, 1882, p. 153).
†*ungula* (*Sepia*), Gabb, 1861, p. 324 = *Belosepia ungula* (see *Foss. Cat.* 1, 11, p. 245, 1920).
ursulae (*Crumenasepia*), Cotton, 1929, p. 90, pl. XV, figs. 3 & 4 = *Sepia pharaonis* Ehrenberg, 1831 . . . p. 22
- varietas* (*Sepia*), Lesueur, 1821, p. 101 (nomen nudum).
†*venusta* (*Sepia*), Münster, 1837, p. 252 (nomen nudum); d'Orbigny, 1845 (Pal. univ.), p. 163, pl. V, fig. 7
= *Trachyteuthis venusta* (see *Foss. Cat.* 1, 11, p. 250, 1920).
venusta (*Sepia*), Pfeffer, 1884 (*non* Münster, 1837), p. 12, figs. 15, 15a = *Sepia venustoides* Hoyle, 1909 . . . p. 22
venustoides (*Sepia*), Hoyle, 1909, nom. nov. for *Sepia venusta* Pfeffer, 1884 (*non* Münster, 1837) . . . p. 22
†*vera* (*Sepia*), Deshayes, 1863, p. 613, pl. CVI, figs. 11 & 12 (see *Foss. Cat.* 1, 11, p. 248, 1920).
veranyi (*Sepia*), Lagatu, 1888, p. 115, pl. VIII = ? sub-sp. of *Sepia officinalis* Linné, 1758.
vermiculata (*Sepia*) Quoy & Gaimard, 1832, p. 64, pl. I, figs. 1-5 = *Sepia officinalis vermiculata* . . . p. 30
verreauxi (*Ascarosepion*), Rochebrune, 1884, p. 98 = *Sepia mestus* Gray, 1849 . . . p. 45
verreauxi (*Amplisepia*), Iredale, 1926 (*non* Rochebrune, 1884) p. 194 = *Sepia apama* Gray, 1849. . . p. 34
†*verrucosa* (*Sepia*), Bellardi, 1872, p. 15, pl. I, fig. 5 (see *Foss. Cat.* 1, 11, p. 248, 1920).
verrucosa (*Sepia*), Lönnberg, 1896, p. 697 (*non* Bellardi, 1872) = *Sepia bertheloti* d'Orbigny, 1839 . . . p. 57
versuta (*Arctosepia*), Iredale, 1926, p. 194, pl. XXIII, figs. 5 & 6 . . . p. 81
vicellius (*Sepia*), Gray, 1849, p. 100 = *Sepia officinalis* Linne, 1758 . . . p. 32
†*vindobonensis* (*Sepia*), Schloenbach, 1869, p. 289, pl. VII.
- wanda* (sub-sp. of *Metasepia pfefferi* (Hoyle)), Iredale, 1954, p. 78, pl. V, figs. 9-11 . . . p. 114
weberi (*Sepiella*), Adam, 1939, p. 98, pl. IV, figs. 1 & 2 . . . p. 128
whitleyanum (*Acanthosepion*), Iredale, 1926, p. 195, pl. XXIII, figs. 9 & 10. . . p. 16
winckworthi (*Sepia*), Adam, 1939, p. 1, fig. 1, pl. I. = *Sepia brevimana* Steenstrup, 1875 . . . p. 5
- xera* (sub-sp. of *Arctosepia braggi* (Verco)), Iredale, 1954, p. 74, pl. V, figs. 19-21. . . p. 80
- zanzibarica* (*Sepia*), Pfeffer, 1884, p. 9, figs. 11 & 11a. . . p. 7
zebrina (*Sepia*), Risso, 1854, p. 15, pls. III-IV = *Sepia officinalis* Linné, 1758.

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vermiculata, *Sepia officinalis* 30, 135, 138, 145, 151, 155
vermiculatum, *Acanthosepion* 30
verreauxi Iredale, *Amplisepia* 34, 38, 155
verreauxi Rochebrune, *Amplisepia* 37, 147
verreauxi, *Ascarosepion* 45, 47, 139, 147, 155
verreauxi, *Sepia* 38, 47, 106
verrucosa Lönnberg, *Sepia* 57
 †verrucosa, *Sepia* 155
versuta, *Arctosepia* 80-1, 155
versuta, *Sepia* 147
vicellius, *Sepia* 32, 131, 155
vicellus, *Sepia* 32
 †vindobonensis, *Sepia* 155
vulgaris, *Loligo* 152
vulgaris, *Octopus* 153
wanda, *Metasepia pfefferi* 114, 116, 155
weberi, *Sepiella* 123, 128, 144, 147, 155
whitleyana, *Sepia* 16, 21, 137, 147
whitleyanum, *Acanthosepion* 16, 155
winckworthi, *Sepia* 5, 6, 124, 155
xera, *Arctosepia braggi* 80, 155
zanzibarica, *Sepia* 4, 7, 25, 137-8, 147, 155
zebrina, *Sepia* 155

PLATES

PLATE I

- FIGS. 1 & 2. *Sepia thurstoni* sp. nov.: Holotype, ♂; dorsal and ventral views of shell (L. = 80 mm). Madras (B.M. No. 1894.9.6.2-4).
- FIGS. 3 & 4. *Sepia thurstoni* sp. nov.: Paratype, ♀; dorsal and ventral views of shell (L. = 73 mm). Negombo, Ceylon (B.M. No. 1947.5.5.36).



PLATE 2

- FIGS. 5 & 6. *Sepia brevimana* Steenstrup: ? ♂; dorsal and ventral views of shell (L. = 72 mm).
Madras (B.M. No. 1952.11.24.56-58).
- FIGS. 7 & 8. *Sepia brevimana* Steenstrup: ? ♀; dorsal and ventral views of shell (L. = 65 mm).
Singapore (B.M. No. 1952.11.24.67).
- FIGS. 9-11. *Sepia zanzibarica* Pfeffer: dorsal, ventral & lateral views of shell (L. = 184 mm).
Mombasa (B.M. No. 196352W).



PLATE 3

- FIGS. 12 & 13. *Sepia lycidas* Gray: ♀; dorsal and ventral views of shell (L. = 198 mm). China (B.M. No. 1884.2.21.17).
- FIGS. 14 & 15. *Sepia lycidas* Gray: dorsal and ventral views of shell (L. = 193 mm). Sarawak, Borneo (B.M. No. 1894.7.14.5).
- FIGS. 16 & 17. *Sepia savignyi* Blainville: dorsal and ventral views of shell (L. = 70 mm). Persian Gulf (B.M. No. 1904.2.29.4).



PLATE 4

- FIGS. 18 & 19. *Sepia savignyi* Blainville: ♀; dorsal and ventral views of shell (L. = 88 mm).
Near Cape Guardafui (John Murray Expedition, Sta. 27) (B.M. No. 196353W).
- FIGS. 20 & 21. *Sepia aculeata* Férussac & d'Orbigny: ♂; dorsal and ventral views of shell (L. =
112 mm). Penang (B.M. No. 1860.6.2.86).
- FIGS. 22 & 23. *Sepia prionota* Voss: Paratype, ♀; dorsal and ventral views of shell (L. = 36 mm).
Off Sirun Island, Sulu Archipelago (Smithsonian Institution).



PLATE 5

- FIGS. 24 & 25. *Sepia elliptica* Hoyle: Syntype, ♂: dorsal and ventral views of shell (L. = 72 mm).
Challenger Sta. 190, Arafura Sea (B.M. No. 1889.4.24.73).
- FIGS. 26 & 27. *Sepia elliptica* Hoyle: Syntype, ♀: dorsal and ventral views of shell (L. = 54 mm).
Challenger Sta. 190, Arafura Sea (B.M. No. 1889.4.24.74).



PLATE 6

- FIGS. 28 & 29. *Sepia whitleyana* (Iredale): dorsal and ventral views of shell (L. = 89 mm).
Caloundra, Queensland (B.M. No. 1962255W).
- FIGS. 30 & 31. *Sepia esculenta* Hoyle: Syntype, ♂; dorsal and ventral views of shell (L. = 158 mm).
Yokohama Market, Japan (B.M. No. 1889.4.24.69).
- FIGS. 32 & 33. *Sepia esculenta* Hoyle: Syntype ♀; dorsal and ventral views of shell (L. = 142 mm).
Yokohama Market, Japan (B.M. No. 1889.4.24.70).



PLATE 7

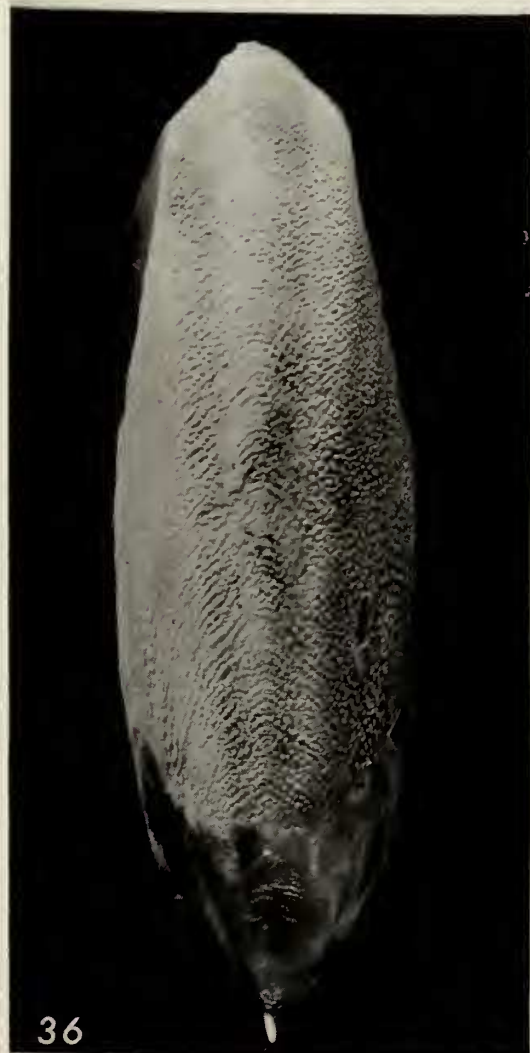
- FIGS. 34 & 35. *Sepia smithi* Hoyle: Syntype, ♀: dorsal and ventral views of shell (L. = 81 mm).
Challenger Sta. 188, Arafura Sea (B.M. No. 1889.4.24. 66-67).
- FIGS. 36 & 37. *Sepia pageora* (Iredale): ♂; dorsal and ventral views of shell (L. = 90 mm). Cape
Upstart, Australia (B.M. No. 1963118W).



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PLATE 8

- FIGS. 38 & 39. *Sepia pharaonis* Ehrenberg: ?♂; dorsal and ventral views of shell (L. = 150 mm).
Trincomali (B.M. No. 1952.11.21.27).
- FIGS. 40 & 41. *Sepia pharaonis* Ehrenberg: ♀; dorsal and ventral views of shell (L. = 153 mm).
Ennûr (B.M. No. 1952.11.24.8).
- FIGS. 42 & 43. *Sepia pharaonis* Ehrenberg: dorsal and ventral views of shell (L. = 168+ mm).
Cottesloe, W. Australia (B.M. No. 1962260W).

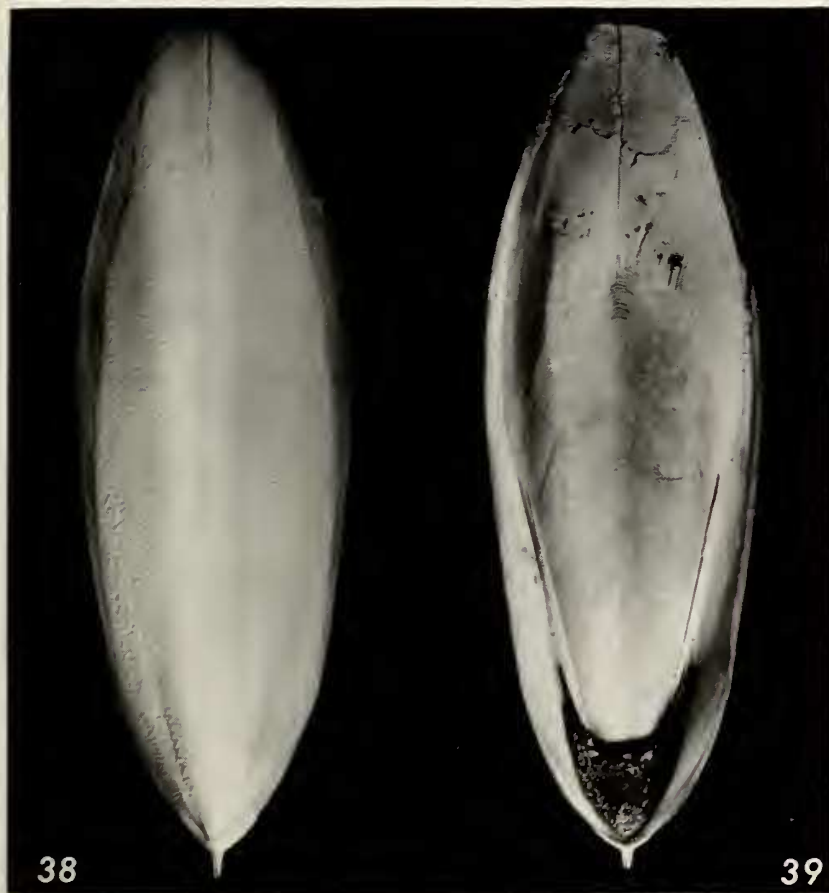


PLATE 9

- FIGS. 44 & 45. *Sepia prashadi* Winckworth: ♂; dorsal and ventral views of shell (L. = 88 mm).
John Murray Expedition, Sta. 75, Gulf of Oman (B.M. No. 196365W).
- FIGS. 46-48. *Sepia prashadi* Winckworth: ♀; dorsal, ventral and lateral views of shell (L. = 120 mm). See data as for Figs. 44 & 45.
- FIGS. 49 & 50. *Sepia recurvirostra* Steenstrup: ♂; dorsal and ventral views of shell (L. = 60 mm).
Singapore fish market (B.M. No. 1947.5.16.2).
- FIGS. 51 & 52. *Sepia recurvirostra* Steenstrup: ?♂; dorsal and ventral views of shell (L. = 45 mm).
Singapore (B.M. No. 1952.11.24.93).

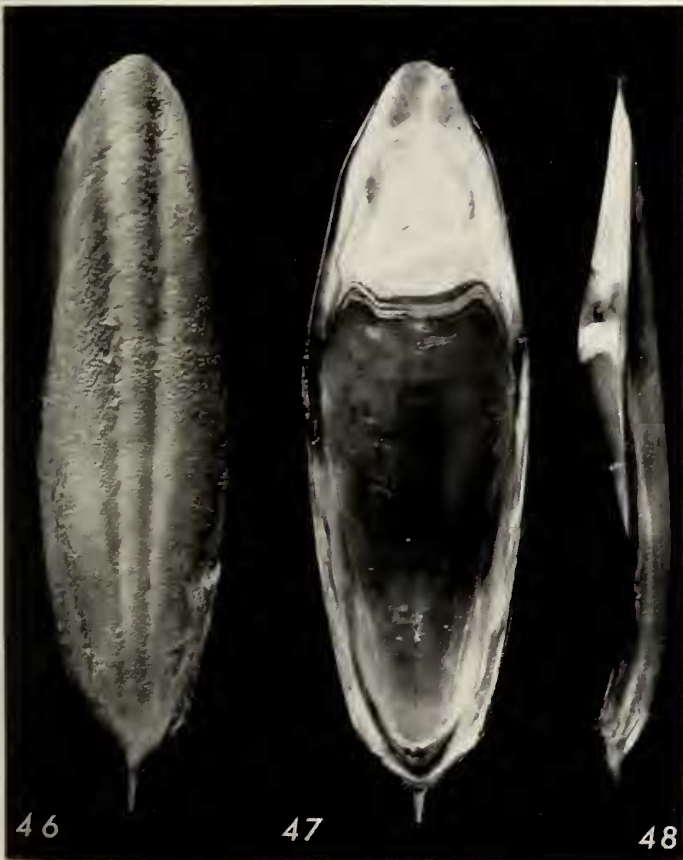
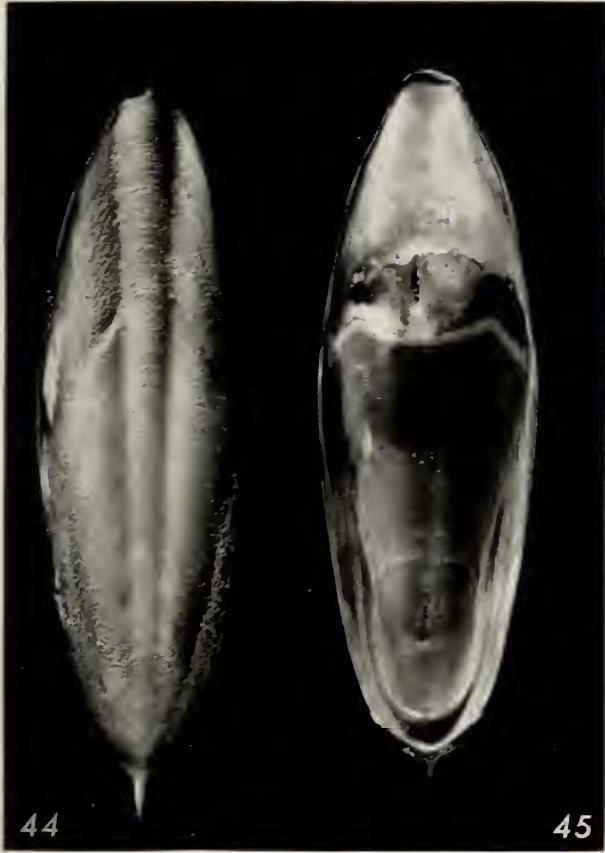


PLATE 10

- FIGS. 53 & 54. *Sepia recurvirostra* Steenstrup: ♂; dorsal and ventral views of shell (L. = 71 mm).
N. China (B.M. No. 1863.5.1.6).
- FIGS. 55 & 56. *Sepia officinalis vermiculata* Quoy & Gaimard: dorsal and ventral views of shell
(L. = 115 mm). Isipingo, S. Africa (B.M. No. 1952.11.24.80).



PLATE 11

- FIGS. 57 & 58. *Sepia officinalis hierredda* Rang: ♂; dorsal and ventral views of shell (L. = 320 mm).
From 15°57'S., 111°40'E. (I.R.S.N. Bruxelles).
- FIGS. 59 & 60. *Sepia officinalis hierredda* Rang: ♀; dorsal and ventral views of shell (L. = 268 mm).
Data as for Figs. 57 & 58.
- FIGS. 61 & 62. *Sepia latimanus* Quoy & Gaimard: ♀; dorsal and ventral views of shell (L. = 260 mm).
Singapore fish market (B.M. No. 1947.5.16.1).
- FIG. 63. *Sepia latimanus* Quoy & Gaimard: ♀. Abnormal right ventral arm (distal 4 cm).
Data as for Figs. 61 & 62.



PLATE 12

- FIGS. 64 & 65. *Sepia apama* Gray: ♀; dorsal and ventral views of shell (L. = 300 mm). Cobblers Beach, Port Jackson (B.M. No. 1890.6.21.1).
- FIGS. 66 & 67. *Sepia apama* Gray: dorsal and ventral views of shell (L. = 97 mm). Semaphore, South Australia (B.M. No. 1962259W).
- FIGS. 68 & 69. *Sepia papuensis* Hoyle: Syntype, ♂; dorsal and ventral views of shell (L. = 63 mm). Challenger Sta. 188, Arafura Sea (B.M. No. 1889.4.24.68).

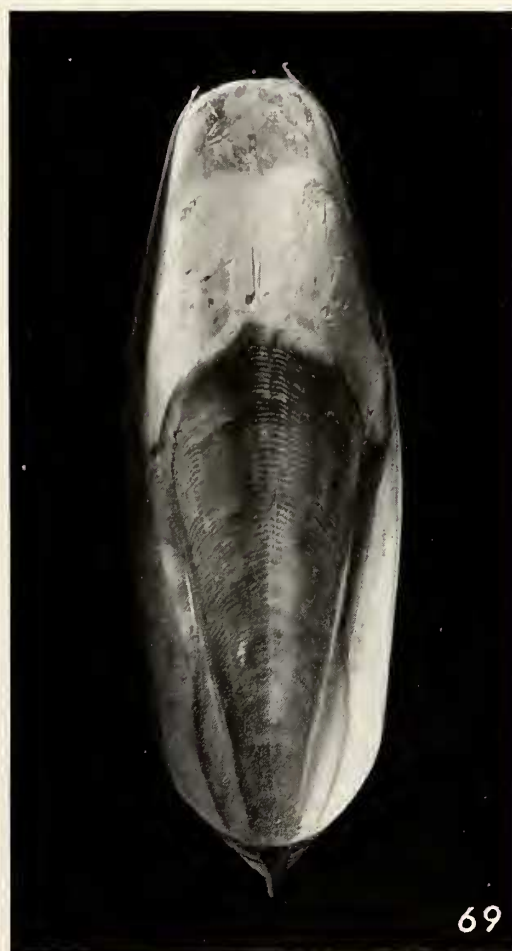
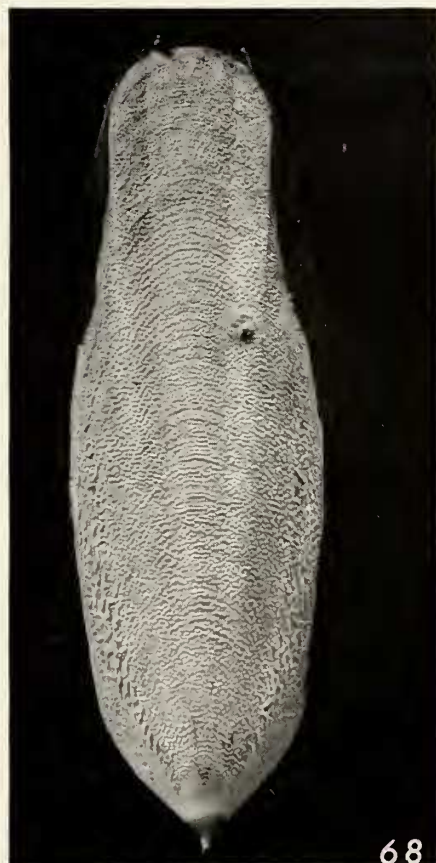


PLATE 13

- FIGS. 70 & 71. *Sepia plangon* Gray: ♀; dorsal and ventral views of shell (L. = 69 mm). Port Jackson, Australia (Admiralty) (B.M. No. 196375W).
- FIGS. 72 & 73. *Sepia plangon* Gray: dorsal and ventral views of shell (L. = 83 mm). Caloundra, Queensland (B.M. No. 1915.8.28.1).
- FIGS. 74 & 75. *Sepia mestus* Gray: ♀; dorsal and ventral views of shell (L. = 46.5 mm). N. China (B.M. No. 1863.5.1.6).



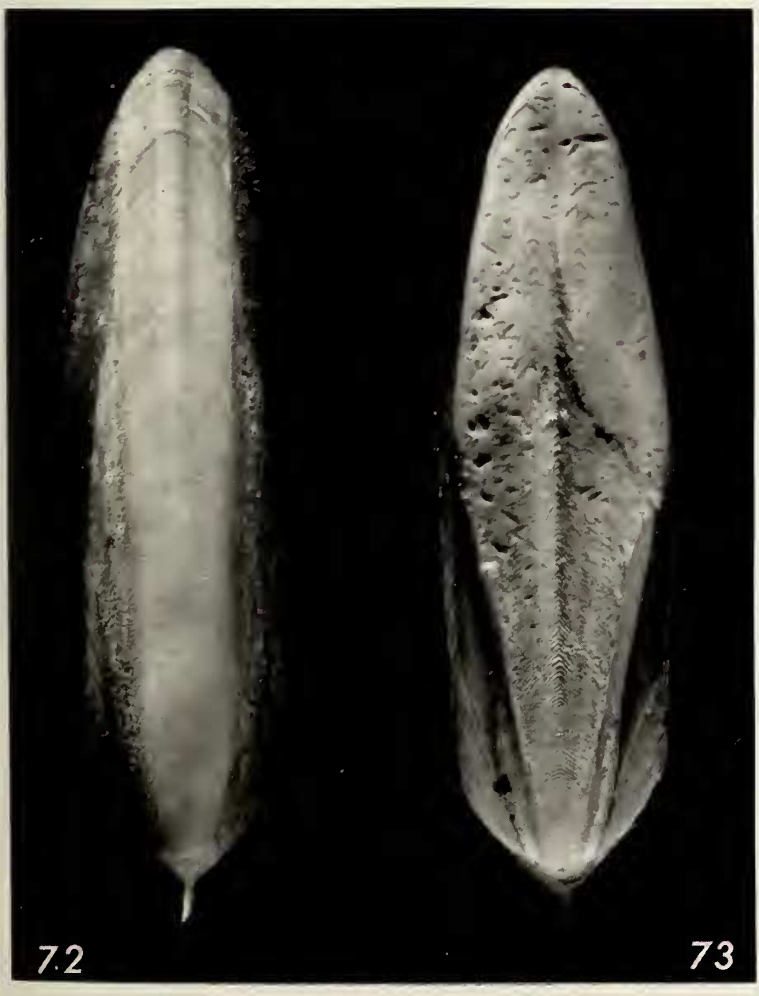
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PLATE 14

- FIGS. 76 & 77. *Sepia mestus* Gray: Syntype; dorsal and ventral views of shell (L. = 51 mm)
Australia (B.M. No. 1842.11.9.54).
- FIGS. 78 & 79. *Sepia mestus* Gray: dorsal and ventral views of shell (L. = 91 mm). Caloundra,
Queensland (B.M. No. 1915.8.28.2-3).



PLATE 15

- FIGS. 80 & 81. *Sepia mestus* Gray: dorsal and ventral views of shell (L. = 64 mm). Caloundra, Queensland (B.M. No. 1915.8.28.2-3).
- FIGS. 82 & 83. *Sepia mestus* Gray: Holotype of *Ascarosepion verreauxi* Rochebrune; dorsal and ventral views of shell (L. = 137 mm). Sydney (Mus. nat. Hist. nat. Paris).
- FIGS. 84-86. *Sepia novaehollandiae* Hoyle: dorsal and ventral views of three shells (L. = 42, 47 and 48 mm). Adelaide (B.M. No. 1890.3.24.280-2).
- FIGS. 87 & 88. *Sepia novaehollandiae* Hoyle: ? ♀; dorsal and ventral views of shell (L. = 122 mm). Semaphore, South Australia (B.M. No. 1962256W/1).
- FIGS. 89 & 90. *Sepia novaehollandiae* Hoyle: ? ♂; dorsal and ventral views of shell (L. = 122 mm). Semaphore, S. Australia (B.M. No. 1962256W/2).



PLATE 16

- FIGS. 91 & 92. *Sepia acuminata* Smith: Syntype; dorsal and ventral views of shell (L. = 104 mm). Port Elizabeth, South Africa (B.M. No. 1890.9.22.332-3).
- FIGS. 93 & 94. *Sepia jaenschi* (Cotton): dorsal and ventral views of shell (L. = 112 mm). Robe, South Australia (B.M. No. 1962258W).
- FIGS. 95 & 96. *Sepia bertheloti* d'Orbigny: ♂; dorsal and ventral views of shell (L. = 170 mm). From 6°18'S., 11°54'E. (I.R.S.N., Bruxelles).
- FIGS. 97 & 98. *Sepia bertheloti* d'Orbigny: ♀; dorsal and ventral views of shell (L. = 130 mm). From 7°16'S., 12°17'E. (I.R.S.N., Bruxelles).

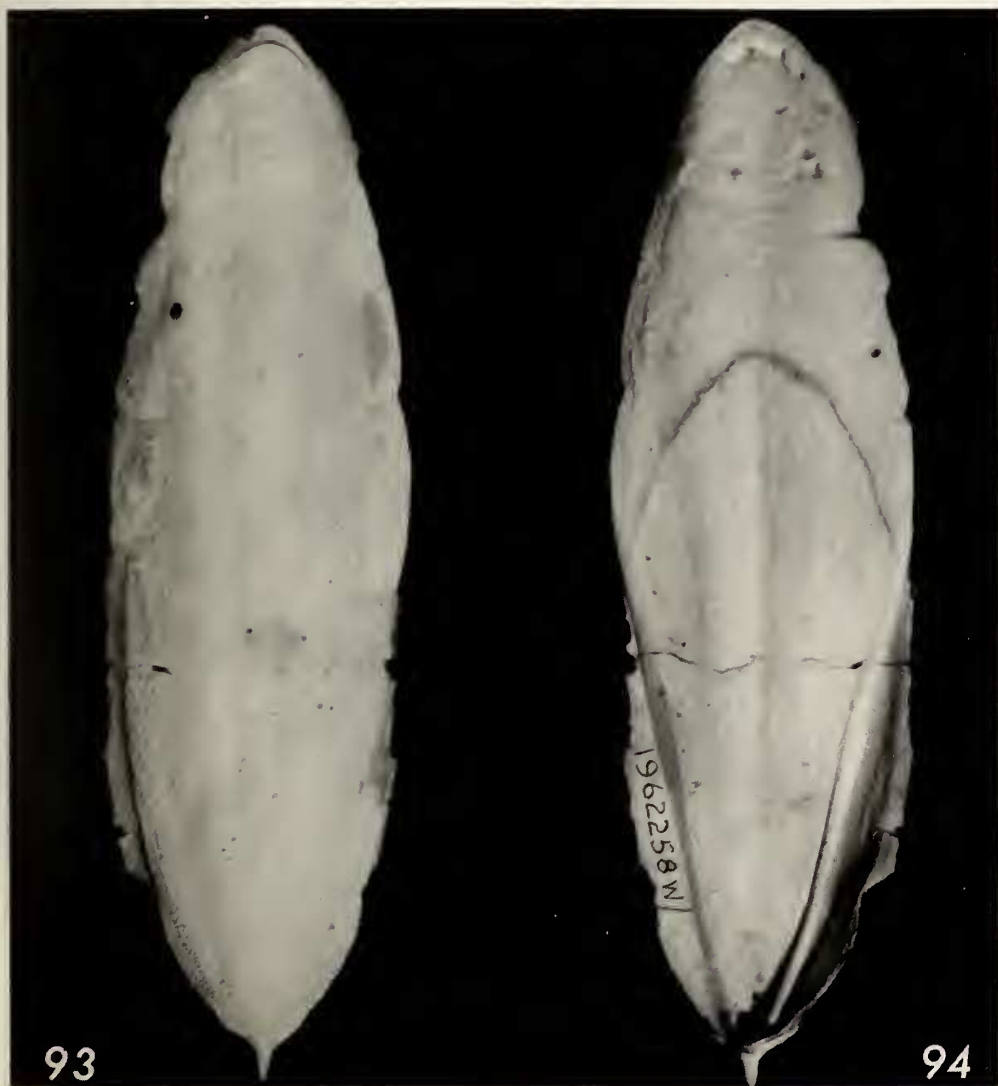


PLATE 17

- FIGS. 99 & 100. *Sepia cultrata* Hoyle: dorsal and ventral views of shell (L. = 85 mm). Sydney, Australia (B.M. No. 1837.5.13.44).
- FIGS. 101-103. *Sepia appellöfi* Wülker: ♀; dorsal, ventral and lateral views of shell (L. = 90 mm). Sagami Bay, Japan (B.M. No. 1910.9.29.1).
- FIGS. 104-106. *Sepia sewelli* sp. nov.: Paratype; dorsal, ventral and lateral views of shell (L. = 31 mm). John Murray Expedition, Sta. 106, 5°38'54"S., 39°15'42"E. to 5°40'18"S., 39°17'36"E. (B.M. No. 196380W).

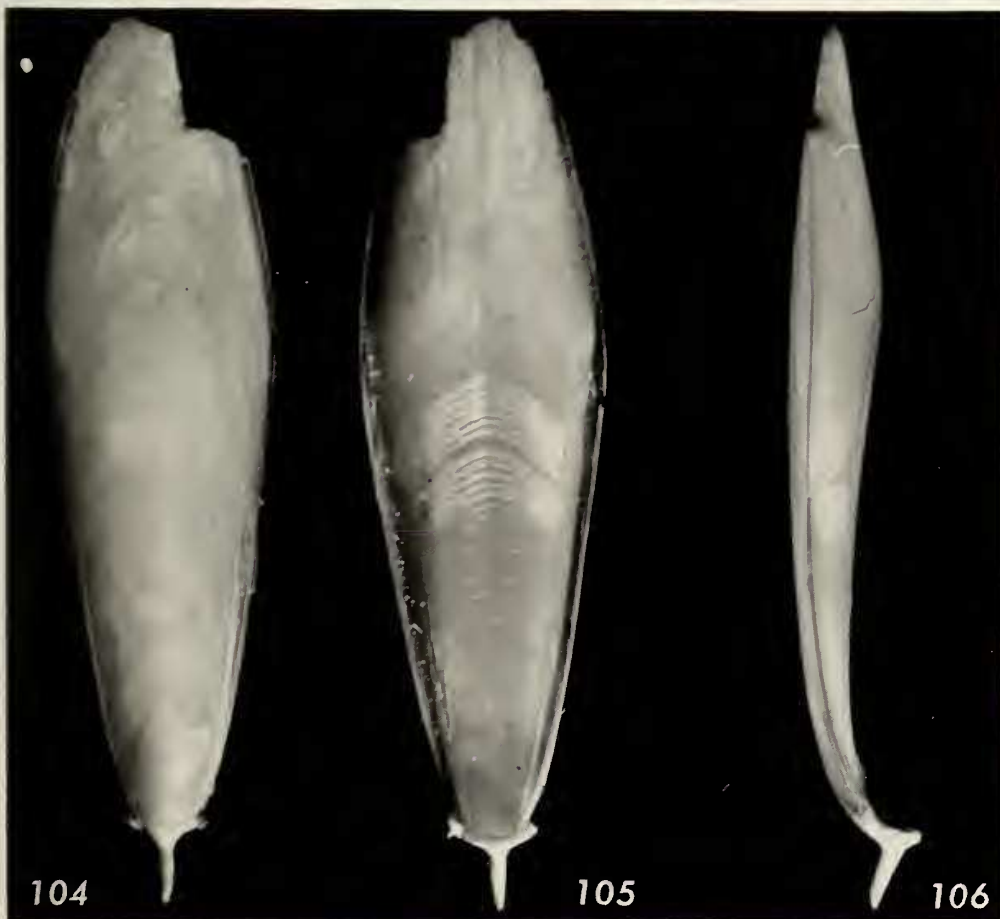


PLATE 18

- FIGS. 107-109. *Sepia murrayi* sp. nov.: Holotype, ♀; dorsal, ventral and lateral views of shell (L. = 40 mm). John Murray Expedition, Sta. 71, Gulf of Oman (B.M. No. 196381W).
- FIGS. 110 & 111. *Sepia murrayi* sp. nov.: Paratype, ♀; dorsal and ventral views of whole animal (dorsal mantle-length, 40 mm). John Murray Expedition, Sta. 71 (B.M.No. 196382W).
- FIGS. 112 & 113. *Sepia confusa* Smith; ♀; dorsal and ventral views of shell (L. = 84 mm). John Murray Expedition, Sta. 106, 5°38'54"S., 39°15'42"E. to 5°40'18"S., 39°17'36"E. (B.M. No. 196384W).

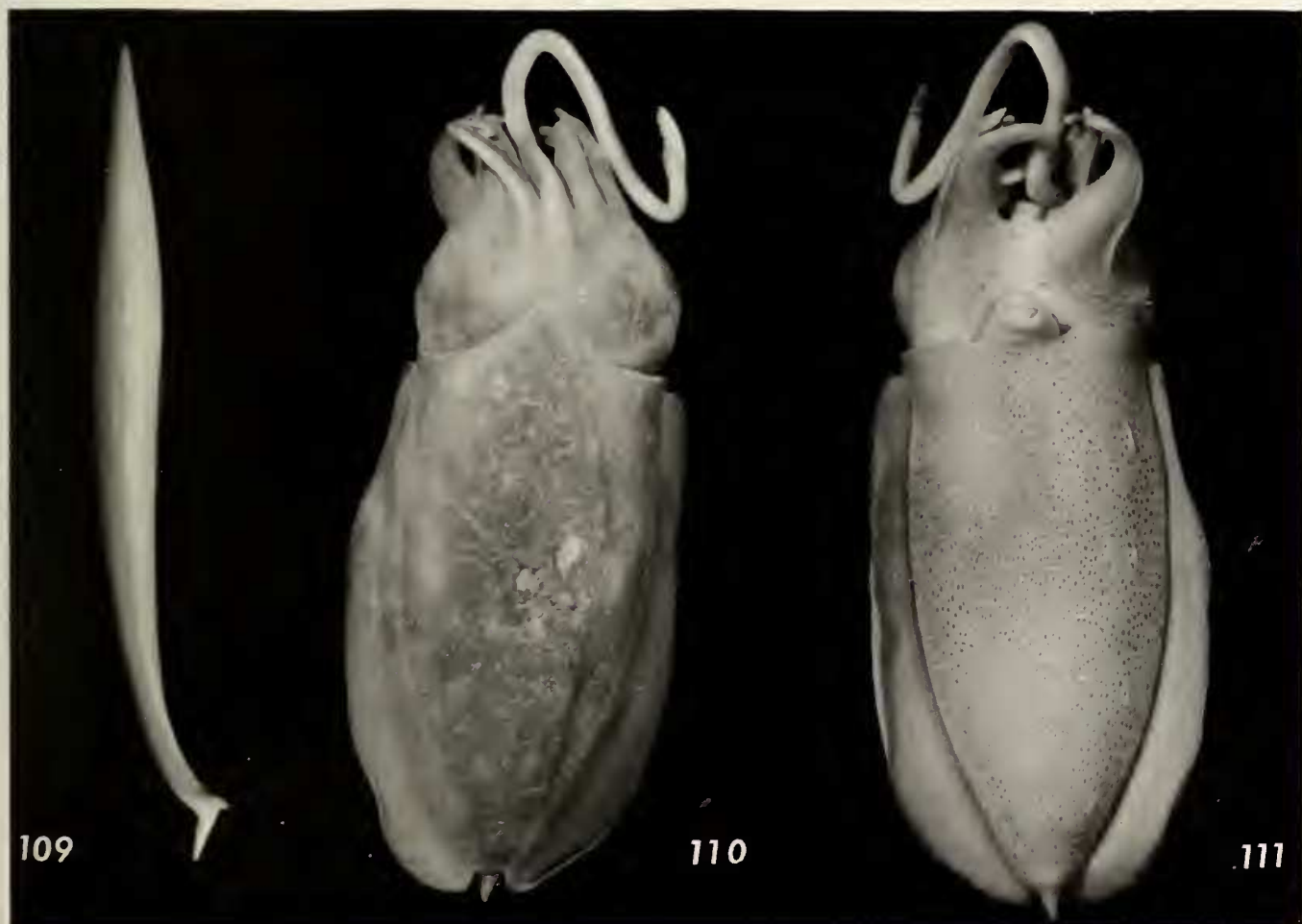
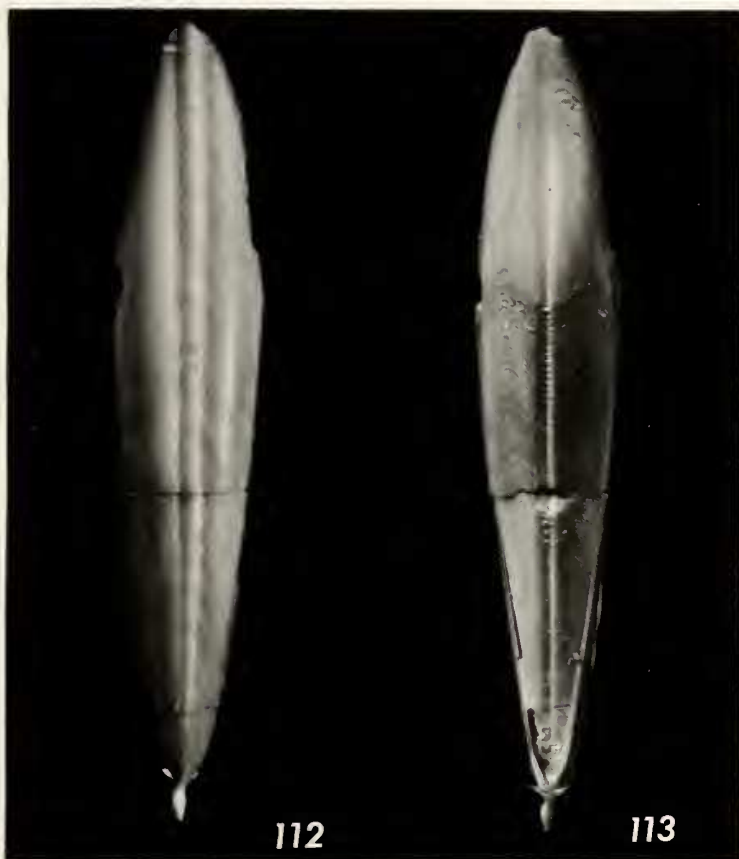


PLATE 19

- FIGS. 114 & 115. *Sepia incerta* Smith: Syntype; dorsal and ventral views of imperfect shell (L. = 119⁺mm). Port Elizabeth, S. Africa (B.M. No. 1890.12.14.43-44).
- FIGS. 116 & 117. *Sepia kubiensis* Hoyle: Holotype, ♀; dorsal and ventral views of shell (L. = 40.5⁺ mm). *Challenger* Sta. 233, Bay of Kobe, Japan (B.M. No. 1889.4.24.81).
- FIGS. 118-120. *Sepia kubiensis* Hoyle: Syntype (? ♀) of *S. andreanoides* Hoyle; dorsal, ventral and lateral views of shell (L. = 60 mm). Yokohama Market, Japan (B.M. No. 1889.4.24.78).
- FIGS. 121-123. *Sepia braggi* Verco: dorsal, ventral and lateral views of shell (L. = 56 mm). Adelaide, South Australia (B.M. No. 1952.11.24.34-36).
- FIGS. 124-126. *Sepia braggi* Verco: dorsal, ventral and lateral views of shell (L. = 36 mm). Adelaide, S. Australia (B.M. No. 1952.11.24.34-36).

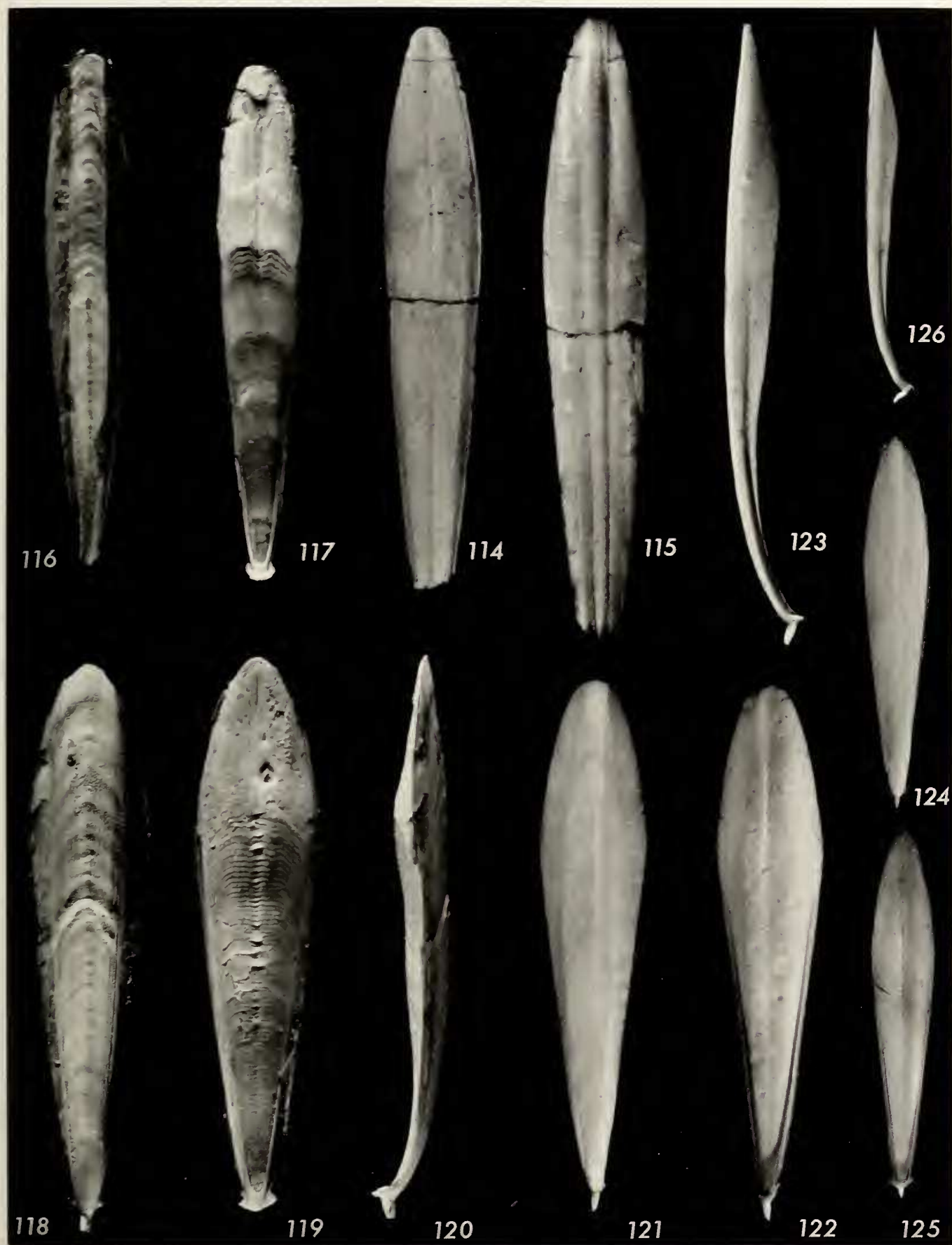


PLATE 20

FIGS. 127-128. *Sepia burnupi* Hoyle: dorsal and ventral views of shell (L. = 45 mm). Umkomaas, Natal (B.M. No. 1904.2.13.5).

FIGS. 129-131. *Sepia trygonina* (Rochebrune): ♀; dorsal, ventral and lateral views of shell (L. = 50 mm). John Murray Expedition, Sta. 27, near Cape Guardafui (B.M. No. 196388-94W).



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PLATE 21

- FIGS. 132 & 133. *Sepia elongata* d'Orbigny: Holotype; dorsal and ventral views of shell (L. = 48.5+ mm). Near Cosseir, Red Sea (Mus. nat. Hist. nat. Paris).
- FIGS. 134 & 135. *Sepia orbignyana* Férussac: ♂; dorsal and ventral views of shell (L. = 86 mm). African coast, S. Atlantic (I.R.S.N.).
- FIGS. 136 & 137. *Sepia orbignyana* Férussac: ♀; dorsal and ventral views (L. = 83 mm). Position, 6°29'S., 11°35'E. (I.R.S.N.).
- FIGS. 138-140. *Sepia australis* Quoy and Gaimard: dorsal, ventral and lateral views of shell (L. = 56.5 mm). Grahamstown, Natal (B.M. No. 1952.11.21.31).
- FIGS. 141 & 142. *Sepia australis* Quoy & Gaimard: Holotype of *S. sinope* Gray; dorsal and ventral views of shell (L. = 44+mm). ? China (B.M. No. 196385W).

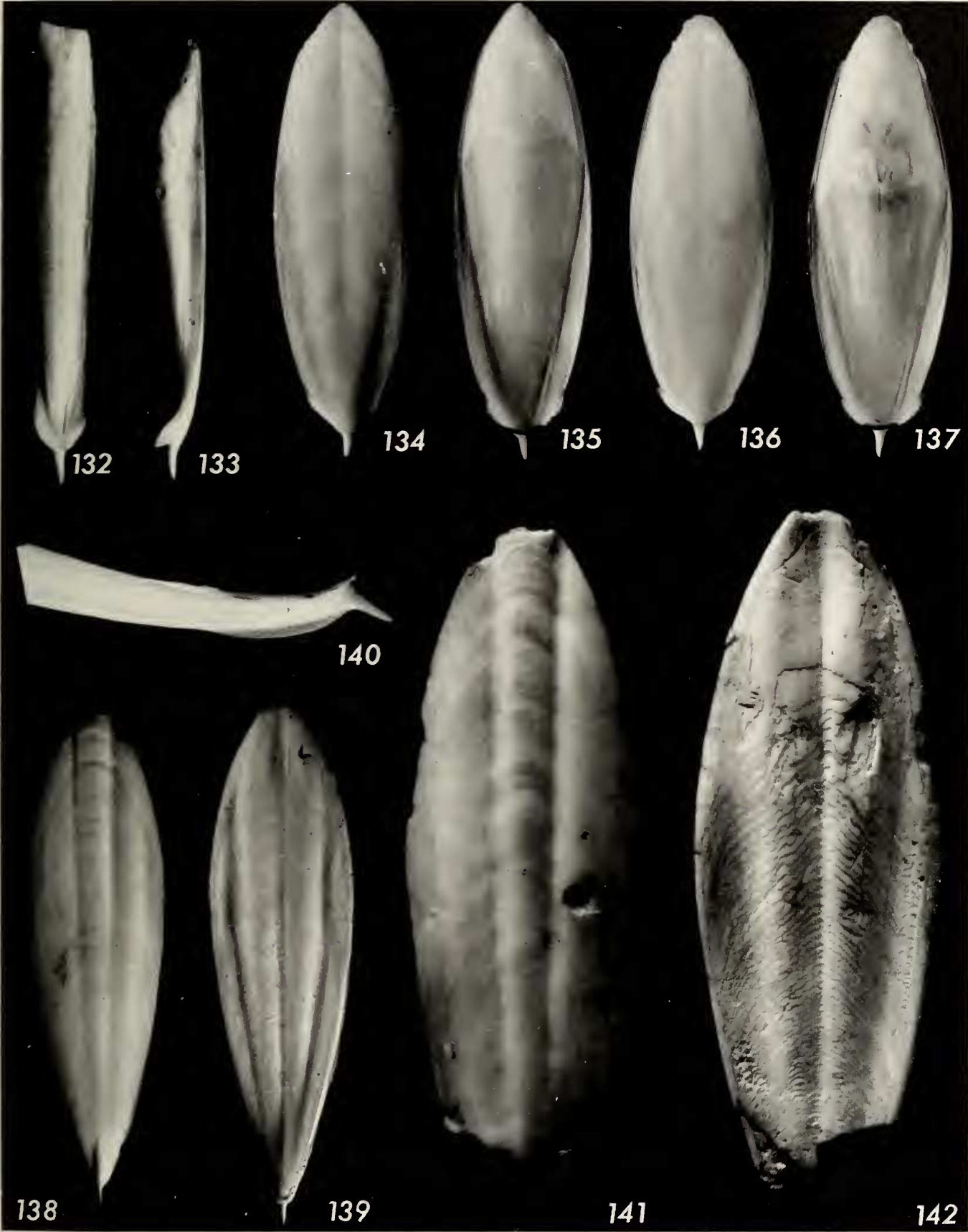


PLATE 22

FIGS. 143-145.

Sepia omani sp. nov.: Holotype, ♂; dorsal, ventral and lateral views of shell (L. = 62 mm). John Murray Expedition, Sta. 75, Gulf of Oman (B.M. No. 1963107W).

FIG. 146 & 147.

Sepia omani sp. nov.: Paratype, ♀; dorsal and ventral views of posterior end of shell (Length of whole shell, 53 mm). John Murray Expedition, Sta. 75, Gulf of Oman (B.M. No. 1963108-114W).



PLATE 23

- FIGS. 148 & 149. *Sepia elegans* Blainville: ♂; dorsal and ventral views of shell (L. = 54 mm). Position, 0°S., 8°58'E. (I.R.S.N.).
- FIGS. 150 & 151. *Sepia elegans* Blainville: ♀; dorsal and ventral views of shell (L. = 77.5 mm). Position, 6°18'S., 11°34'E. (I.R.S.N.).
- FIGS. 152-155. *Sepia arabica* Massy: ♂; dorsal, ventral, lateral and enlarged posterior ventral views of shell (L. = 65 mm). John Murray Expedition, Sta. 194, Gulf of Aden (B.M. No. 196386W).

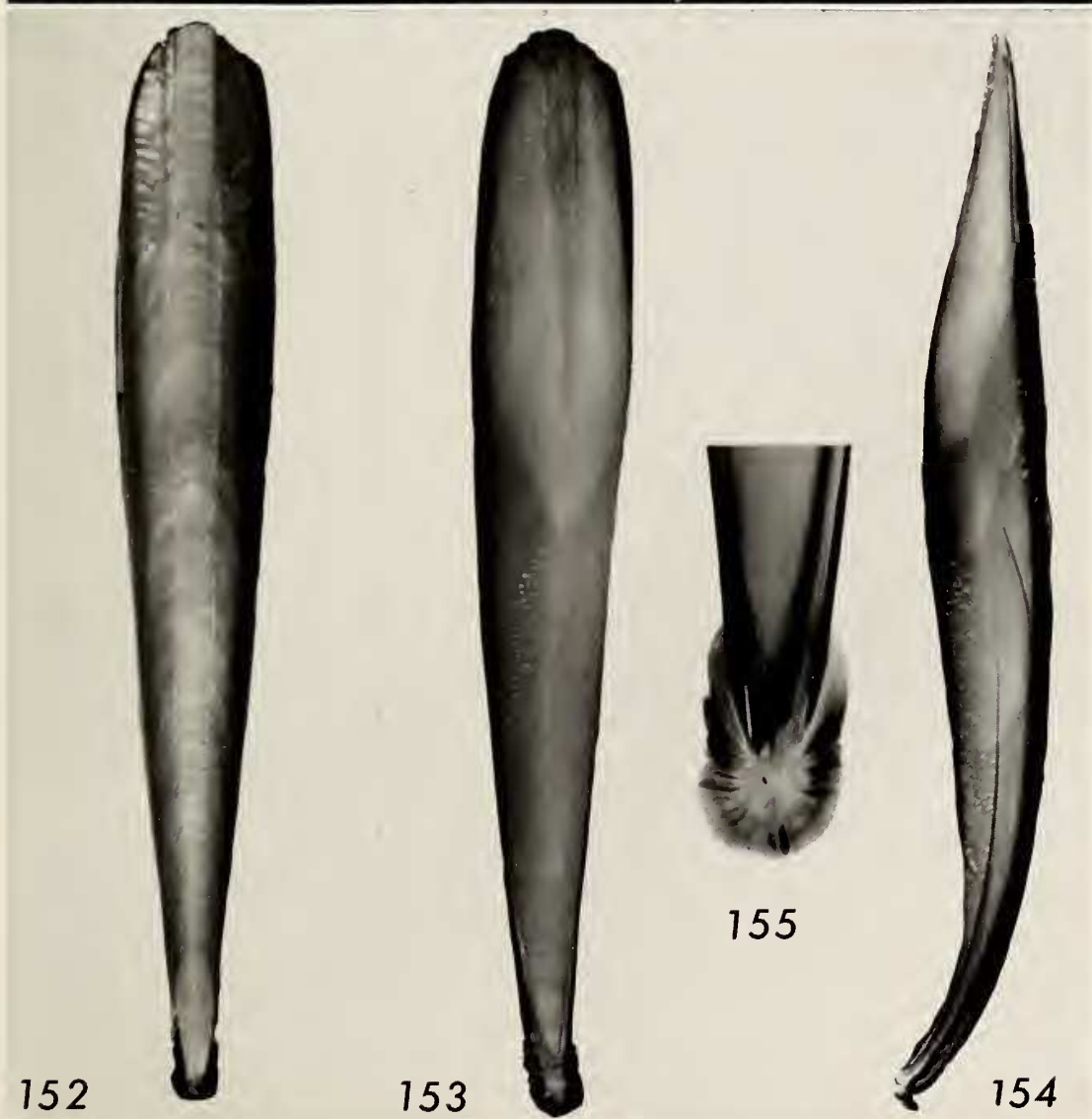


PLATE 24

FIGS. 156-158.

Sepia dollfusi Adam: ♂; dorsal, ventral and lateral views (L. = 48 mm). Suez
(B.M. No. 1926.4.8.1).



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PLATE 25

- FIGS. 159-161. *Sepia gibba* Ehrenberg: ♀; dorsal, lateral and ventral views of shell (L. = 45 mm). Eylath, Gulf of Aqaba, Red Sea (Hebrew University, Jerusalem).
- FIGS. 162 & 163. *Sepia elobyana* Adam: Holotype, ♂; dorsal and ventral views of shell (L. = 40 mm). Eloby Island, Atlantic coast of Africa (I.R.S.N.).
- FIG. 164. *Sepia elobyana* Adam: ♂; ventral view of shell (L. = 47 mm). Gorée, Sénégal (I.R.S.N.).

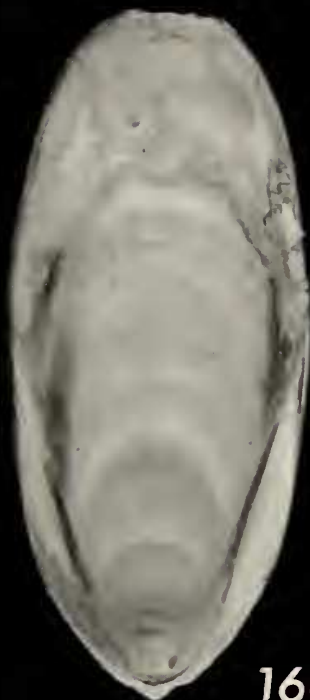


PLATE 26

- FIGS. 165 & 166. *Sepia bandensis* Adam: Syntype, ♂; dorsal and ventral views of shell (L. = 46 mm). Banda Neira, Indonesia (I.R.S.N.).
- FIGS. 167 & 168. *Sepia bandensis* Adam: Syntype, ♀; dorsal and ventral views of shell (L. = 47.5 mm). Banda Neira (I.R.S.N., Bruxelles).
- FIGS. 169 & 170. *Sepia tuberculata* Lamarck: dorsal and ventral views of shell (L. = 66⁺mm). Fort Dauphin, Madagascar (I.R.S.N.).



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PLATE 27

FIGS. 171 & 172.

Sepia tuberculata Lamarck: ♀; dorsal and ventral views of whole animal of 64 mm in dorsal mantle-length. St. James, S. Africa (B.M. No. 1935.3.12.4).

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PLATE 28

- FIGS. 173 & 174. *Sepia tuberculata* Lamarck: ♀; dorsal and ventral views of shell (L. = 42 mm).
Univ. Cape Town Ecological Survey, Knysna 189A, 14 July, 1950 (I.R.S.N.).
- FIGS. 175 & 176. *Sepia papillata* Quoy & Gaimard: dorsal and ventral views of shell (L. = 108 mm).
Port Elizabeth, South Africa (B.M. No. 1890.12.14.45).
- FIGS. 177 & 178. *Sepia papillata* Quoy & Gaimard: dorsal and ventral views of shell (L. = 65.5 mm).
Cape of Good Hope (Zoologisch Museum, Amsterdam).



PLATE 29

- FIGS. 179 & 180. *Sepia simoniana* Thiele: dorsal and ventral views of shell. Tomlin Collection, National Museum of Wales.
- FIGS. 181 & 182. *Sepia ? simoniana* Thiele: dorsal and ventral views of shell (L. = 111 mm). Port Elizabeth, South Africa (B.M. No. 1890.12.14.41).



PLATE 30

- FIGS. 183 & 184. *Sepia* sp.: juv; dorsal and ventral views of shell (L. = 23 mm). John Murray Expedition, Sta. 27, near Cape Guardafui (B.M. No. 1963100W). Compare this shell with that of *S. simoniana* (pl. 29).
- FIGS. 185 & 186. *Sepia myrsus* Gray: Holotype; dorsal and ventral views of shell (L. = 72 mm). China (B.M. No. 1841.4.6.89).
- FIGS. 187 & 188. *Sepia hieronis* Robson: Syntype; dorsal and ventral views of shell (L. = 60 mm). Cape Town (B.M. No. 1924.9.9.54-5).



PLATE 31

FIGS. 189-191.

Sepia insignis Smith: Holotype; dorsal, ventral and lateral views of shell (L. = 26 mm). Tongaat Beach, Natal (B.M. No. 1920.3.23.5).



PLATE 32

- FIGS. 192 & 193. *Sepia (Hemisepius) typica* (Steenstrup): ♂; dorsal and ventral views of whole animal (dorsal mantle-length, 20 mm). Details of locality as for Figs. 194 & 195.
- FIGS. 194 & 195. *Sepia (Hemisepius) typica* (Steenstrup): ♀; dorsal and ventral views of whole animal (dorsal mantle-length, 24 mm). Coll. J. H. Day, Langebaan lagoon, L.B. 76, 15 July, 1946 (B.M. No. 1958.8.20.21-30).

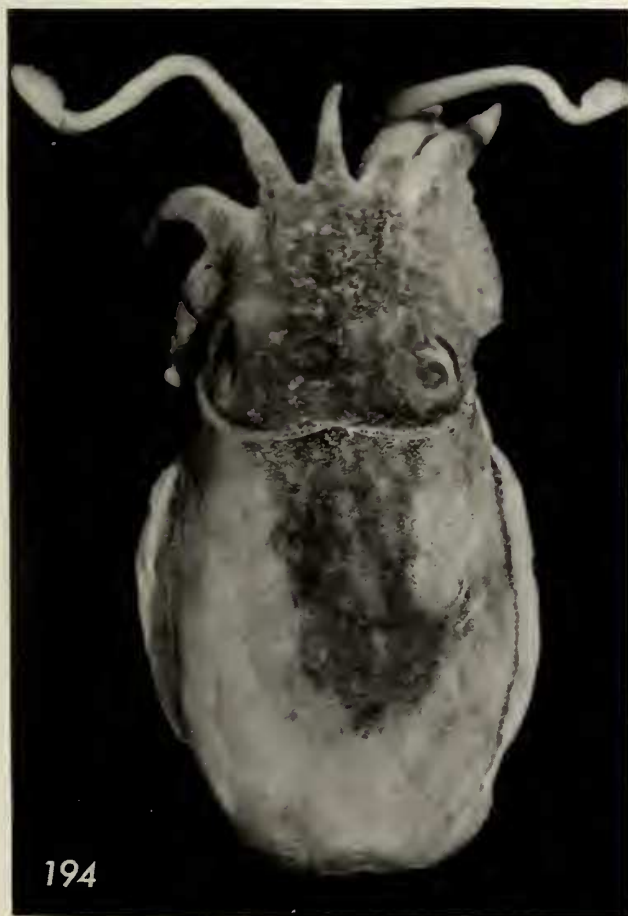


PLATE 33

- FIG. 196. *Sepia (Hemisepius) typica* (Steenstrup): ♂; left hectocotylized ventral arm, 11 mm in length from specimen with a dorsal mantle-length of 19.5 mm. Langebaan lagoon, 15 July, 1946 (B.M. No. 1958.8.20.21-30).
- FIG. 197. *Sepia (Hemisepius) typica* (Steenstrup): ♂; right ventral arm, 9.5 mm in length from a specimen with a dorsal mantle-length of 17.5 mm.



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PLATE 34

- FIGS. 198 & 199. *Sepia (Hemisepius) dubia* sp. nov: Holotype, ♀; dorsal and ventral views of shell (L. = 14.5 mm). False Bay, S. Africa (B.M. No. 1963103W).
- FIGS. 200 & 201. *Sepia (Hemisepius) dubia* sp. nov: Holotype, ♀; dorsal and ventral views of whole animal of dorsal mantle-length of 17 mm. False Bay (Univ. Cape Town Biol. Survey, No. FB 1007 (B.M. No. 1963103W)).



PLATE 35

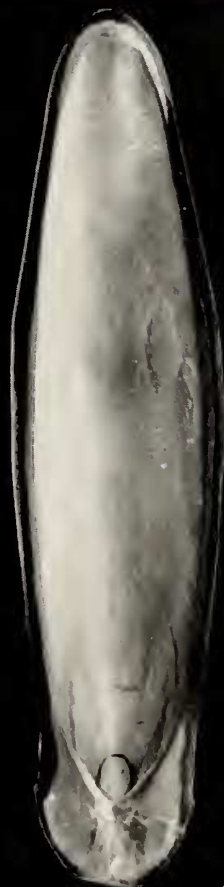
- FIG. 202. *Sepiella ocellata* Pfeffer: Holotype, ♂; ventral view of shell (L. = 45.5 mm). Java.
- FIGS. 203 & 204. *Sepiella ornata* (Rang): ♂; dorsal and ventral views of shell (L. = 85 mm).
Position 5°55'S., 12°01'E. (I.R.S.N.).
- FIGS. 205 & 206. *Sepiella ornata* (Rang): ♀; dorsal and ventral views of shell (L. = 77 mm).
Position and data as for Figs. 203 & 204.
- FIG. 207. *Sepiella ornata* (Rang): ♀; ventral view of shell (L. = 95 mm). Position and data
as for Figs. 203 & 204.



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PLATE 36

- FIGS. 208 & 209. *Sepiella cyanea* Robson: Lectotype, ♂; dorsal and ventral views of shell (L. = 69 mm). Natal (B.M. No. 1924.9.9.40).
- FIGS. 210 & 211. *Sepiella cyanea* Robson: ? ♂; dorsal and ventral views of shell (L. = 76 mm). Isipingo, Natal (B.M. No. 1952.11.21.39-40).
- FIGS. 212 & 213. *Sepiella cyanea* Robson: ♀; dorsal and ventral views of shell (L. = 95 mm). Isipingo, Natal (B.M. No. 1952.11.21.40).
- FIG. 214. *Sepiella cyanea* Robson: Lectotype, ♂; hectocotylus, length 42 mm. Natal (B.M. No. 1924.9.9.40). See also Figs. 208 & 209 and 215.
- FIG. 215. *Sepiella cyanea* Robson: Lectotype, ♂; left tentacular club, length 14 mm. Natal (B.M. No. 1924.9.9.40).



PLATE 37

- FIGS. 216 & 217. *Sepiella weberi* Adam: Syntype, ♂; dorsal and ventral views of shell (L. = 57.5 mm). Timor (Zoologisch Museum, Amsterdam).
- FIGS. 218 & 219. *Sepiella weberi* Adam: Syntype, ♀; dorsal and ventral views of shell (L. = 67 mm). Soemba, Indonesia (Zoologisch Museum, Amsterdam).
- FIGS. 220 & 221. *Sepia trygonina* (Rochebrune): ♂; dorsal and ventral views of whole animal of 40 mm, in dorsal mantle-length. John Murray Expedition, Sta. 10, Red Sea (B.M. No. 196386W).

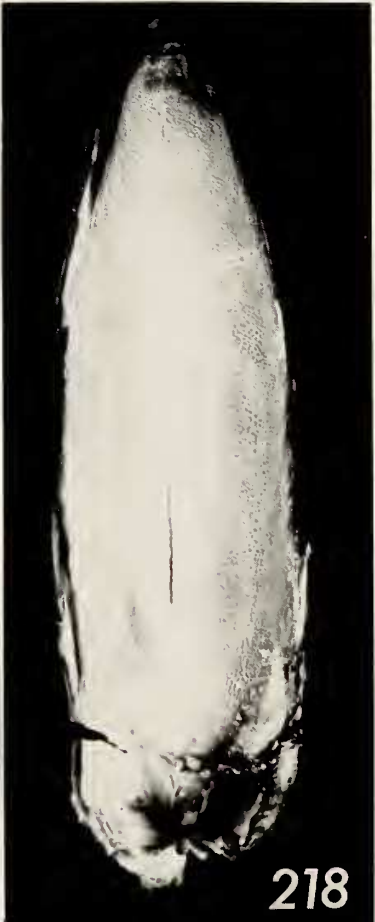
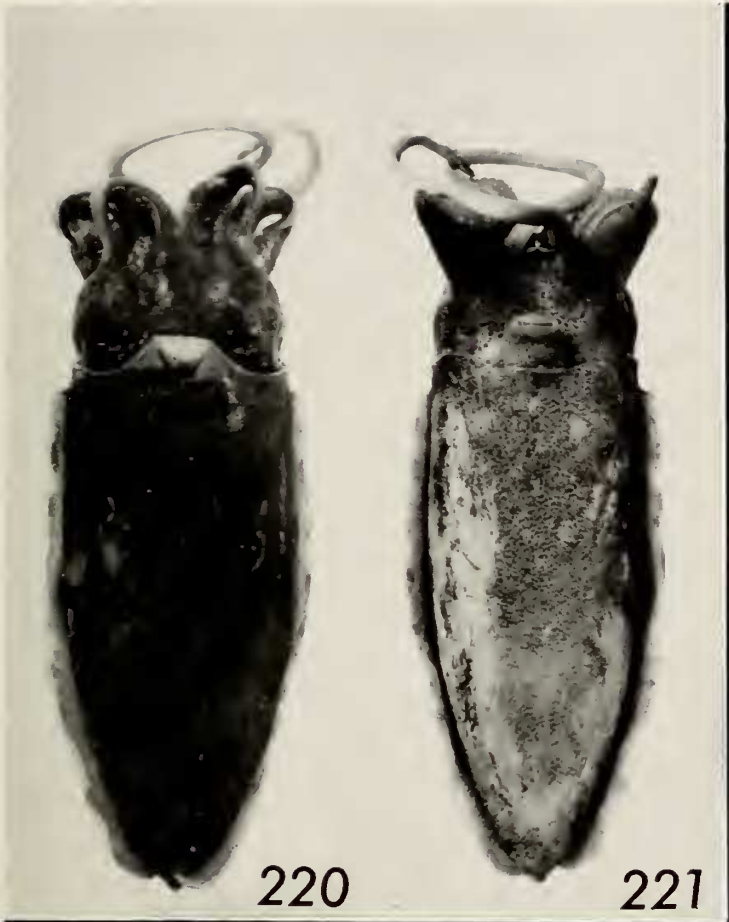


PLATE 38

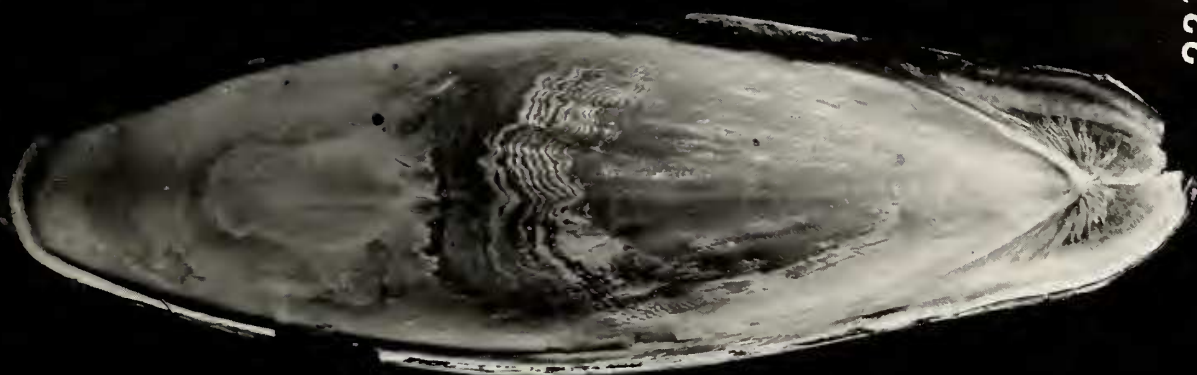
- FIG. 222. *Sepiella inermis* (Férussac & d'Orbigny): ♀; ventral view of shell (L = 69 mm). Sumatra (B.M. No. 1879.10.4.1-2). For a dorsal view see pl. 40, Fig. 233.
- FIGS. 223 & 224. *Sepiella inermis* (Férussac & d'Orbigny): ♀; dorsal and ventral views of shell (L. = 78 mm). Ennûr (B.M. No. 1952.11.24.9-11).
- FIGS. 225 & 226. *Sepiella inermis* (Férussac & d'Orbigny): ♀; dorsal and ventral views of shell (L. = 90 mm). Aden, Coll. A. Fraser Brunner (B.M. No. 1963105W).
- FIG. 227. *Sepiella inermis* (Férussac & d'Orbigny): ♀; dorsal view of whole animal, dorsal mantle-length, 93 mm. Aden, Coll. A. Fraser Brunner (See also Figs. 225 & 226).



PLATE 39

- FIGS. 228 & 229. *Sepiella japonica* Sasaki: ♂; dorsal and ventral views of shell (L. = 126 mm).
Chee-foo, China (B.M. No. 1874.1.24.9).
- FIGS. 230 & 231. *Sepiella japonica* Sasaki: ♀; dorsal and ventral views of shell (L. = 138 mm).
Inland Sea of Japan (B.M. No. 1904.10.28.1-2).

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PLATE 40

- FIG. 232. *Sepiella ornata* Rang: ♀; dorsal view of shell (L. = 95 mm). Position, 5°55'S., 12°01'E. (I.R.N.S.).
- FIG. 233. *Sepiella inermis* (Férussac & d'Orbigny): ♀; dorsal view of shell (L. = 69 mm). Sumatra (B.M. No. 1879.10.4.1-2). For a ventral view of this shell see Pl. 38, fig. 222.
- FIG. 234. *Sepiella inermis* (Férussac & d'Orbigny): ♀; right tentacular club (tentacular club length, 28 mm). Aden, Coll. A. Fraser Brunner (B.M. No. 1963105W).

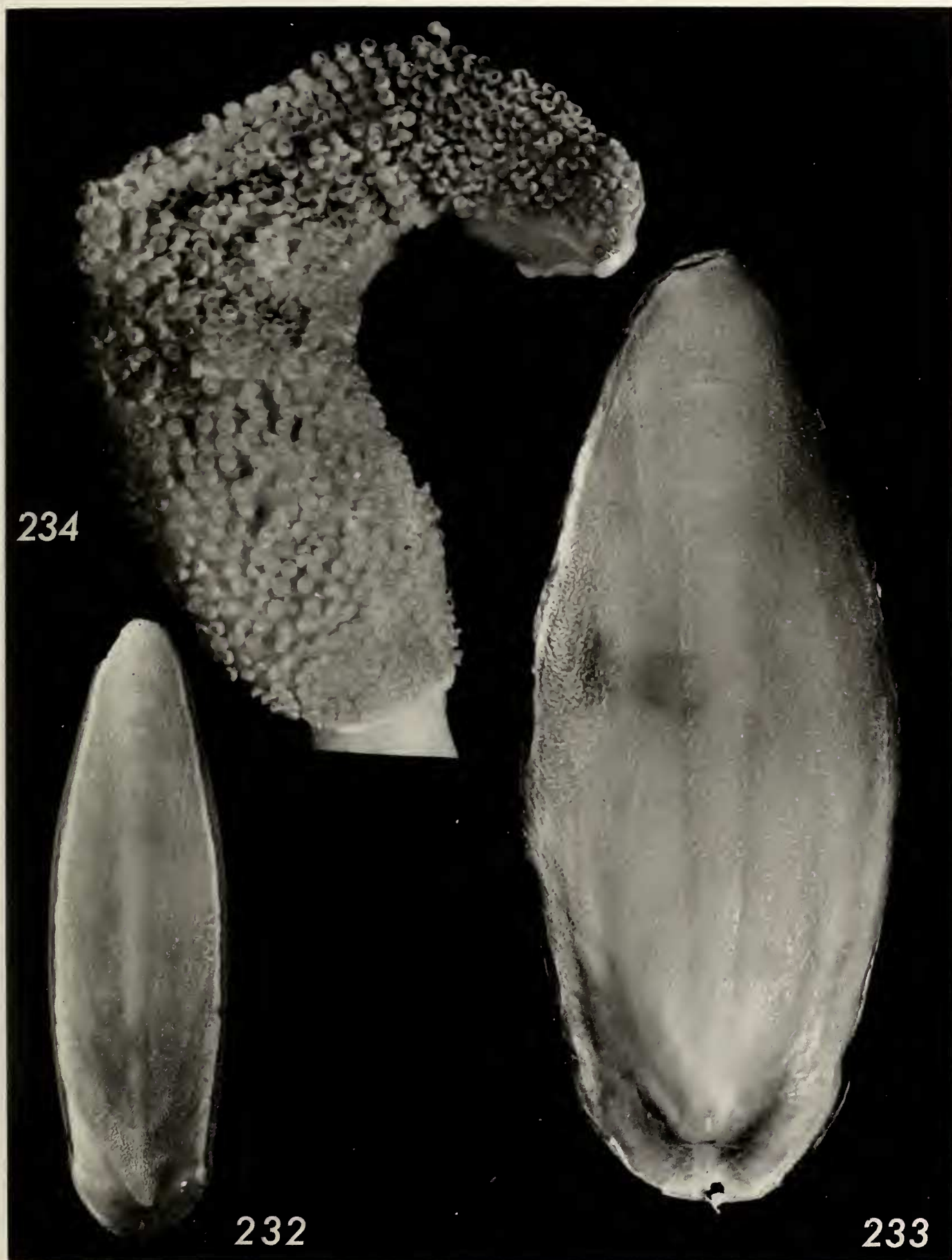


PLATE 41

- FIG. 235. *Sepia thurstoni* sp. nov.: ♀; right tentacular club (T.cl., 15 mm). Negombo, Ceylon (B.M. No. 1917.5.5.36).
- FIG. 236. *Sepia lycidas* Gray: ♀; left tentacular club (T.cl., 37 mm). Inland Sea of Japan (B.M. No. 1904.10.28.5).
- FIG. 237. *Sepia dollfusi* Adam: ♂; right tentacular club (T.cl., 13 mm). Suez (B.M. No. 1947.5.5.46).
- FIG. 238. *Sepia savignyi* Blainville: ♀; left tentacular club (T.cl., 25 mm). See also Pl. 42, Fig. 249. John Murray Expedition, Sta. 27, near Cape Guardafui.
- FIG. 239. *Sepia smithi* Hoyle: Syntype, ♀; right tentacular club (T.cl., 19 mm). *Challenger* Sta. 188, Arafura Sea (B.M. No. 1889.4.24.66-67).
- FIG. 240. *Sepia pharaonis* Ehrenberg: ♂; right tentacular club (T.cl., 20 mm). John Murray Expedition, Sta. 37, Gulf of Aden (B.M. No. 196356W).
- FIG. 241. *Sepia incerta* Smith: ♂; left tentacular club (T.cl., 20 mm). Durban (B.M. No. 196385W).
- FIG. 242. *Sepia omani* sp. nov.: Holotype, ♂; left tentacular club (T.cl., 8 mm). John Murray Expedition, Sta. 75, Gulf of Oman (B.M. No. 1963107W).
- FIG. 243. *Sepia omani* sp. nov.: Paratype, ♀; right tentacular club (T.cl., 9 mm). John Murray Expedition, Sta. 75, Gulf of Oman. The dorsal mantle-length of the animal was 53 mm (B.M. No. 1963108-114W).
- FIG. 244. *Sepia omani* sp. nov.: Paratype, ♀; left tentacular club (T.cl., 9 mm). Details as for Fig. 243.
- FIG. 245. *Sepia prashadi* Winckworth: ♂; left tentacular club (T.cl., 16 mm). John Murray Expedition, Sta. 75, Gulf of Oman (B.M. No. 196365-68W).
- FIG. 246. *Sepia prashadi* Winckworth: ♀; left tentacular club (T.cl., 15 mm). Details as for Fig. 245.
- FIG. 247. *Sepia zanzibarica* Pfeffer: Holotype, ♀; left and right tentacular clubs (T.cl., 35 mm). Zanzibar.



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- FIG. 248. *Sepia confusa* Smith: ♀; left tentacular club (T.cl., 20 mm). Durban (B.M. No. 196385W).
- FIG. 249. *Sepia savignyi* Blainville: ♀; right tentacular club (T.cl., 18 mm). Kameron Island, Red Sea (B.M. No. 196354W. See also Pl. 41, Fig. 238).
- FIG. 250. *Sepia papuensis* Hoyle: Syntype, ♂; left tentacular club (T.cl., 8 mm) from a specimen of 64 mm in dorsal mantle-length. *Challenger* Sta. 188, Arafura Sea (B.M. No. 1889.4.24.68).
- FIG. 251. *Sepia aculeata* Férussac & d'Orbigny: ♂; right tentacular club (T.cl., 29 mm). Penang (B.M. No. 1860.6.2.86).
- FIG. 252. *Sepia prionota* Voss: Paratype, ♀; left tentacular club (T.cl., 3.85 mm) from specimen of 36 mm in dorsal mantle-length. Off Sirun Island, Sulu Archipelago (Smithsonian Institution).
- FIG. 253. *Sepia pageora* (Iredale): ♂; left tentacular club (T.cl., 33 mm). Cape Upstart, Australia (B.M. No. 1963118W).
- FIG. 254. *Sepia simoniana* Thiele: ♀; left tentacular club (T.cl., 85 mm). 18 miles east of Cape Agulhas, S. Africa (University of Cape Town Ecological Survey, T.R.A., 27C) (B.M. No. 196388W).



PLATE 43

- FIG. 255. *Sepia kobiensis* Hoyle: Holotype, ♀; right tentacular club (T.cl., 3.1 mm). *Challenger* Sta. 233, Bay of Kobe, Japan (B.M. No. 1889.4.24.81).
- FIG. 256. *Sepia (Metasepia) pfefferi* Hoyle: Holotype, ♀; left tentacular club (T.cl., 6 mm). *Challenger* Sta. 188, Arafura Sea (B.M. No. 1890.1.24.11).
- FIG. 257. *Sepia joubini* Massy: Syntype, ♂; left tentacular club (T.cl., 3.5 mm). Cape Natal (B.M. No. 1926.10.20.39-40).
- FIG. 258. *Sepia elliptica* Hoyle: Syntype, ♀; right tentacular club (T.cl., 8 mm) from specimen of 54 mm in dorsal mantle-length. *Challenger* Sta. 190, Arafura Sea (B.M. No. 1889. 4.24.74).
- FIG. 259. *Sepia appellöfi* Wülker: ♀; left tentacular club (T.cl., 13.5 mm) of specimen of 90 mm in dorsal mantle-length. Sagami Bay, Japan (B.M. No. 1910.9.29.1).
- FIG. 260. *Sepia murrayi* sp. nov.: Paratype; ♀; left tentacular club (T.cl., 4 mm) of specimen of 40 mm in dorsal mantle-length. John Murray Expedition, Sta. 71, Gulf of Oman (B.M. No. 196382W).
- FIG. 261. *Sepia acuminata* Smith: ♀; left tentacular club (T.cl., 10 mm). Natal (Sta. 95) (B.M. No. 1924.9.9.72-3).
- FIG. 262. *Sepia hieronis* (Robson): ♀; left tentacular club (T.cl., 6 mm). S. African coast (B.M. No. 1958.8.20.7).
- FIG. 263. *Sepia esculenta* Hoyle: ♂; left tentacular club (T.cl., 23 mm). Inland Sea of Japan (B.M. No. 1904.10.28.3-4).



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- FIG. 264. *Sepia kubiensis* Hoyle: Syntype, ♂, of *S. andreanoides*; right tentacular club (T.cl., 6 mm) of specimen of 60 mm dorsal mantle-length (B.M. No. 1889.4.24.78).
- FIG. 265. *Sepia tuberculata* Lamarck: ♀; right tentacular club (T.cl., 20 mm) from specimen of 64 mm in dorsal mantle-length. St. James, South Africa (B.M. No. 1935.3.12.4). See also Fig. 268.
- FIG. 266. *Sepia bandensis* Adam: Syntype, ♂; right tentacular club (T.cl., 8 mm) from specimen of 47 mm in dorsal mantle-length. Banda Neira (I.R.S.N.).
- FIG. 267. *Sepia plangon* Gray: ♂; left tentacular club (T.cl., 11 mm) from specimen of 95 mm in dorsal mantle-length. Port Jackson, Australia (B.M. No. 196374W).
- FIG. 268. *Sepia tuberculata* Lamarck: ♂; right tentacular club (T.cl., 11 mm). Exact locality unknown (B.M. No. 1868.6.8.1).

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PLATE 45

- FIG. 269. *Sepia apama* Gray: ♀; tentacular clubs (T.cl., 70-75 mm) from a specimen of 300 mm in dorsal mantle-length. Cobblers Beach, Port Jackson, Australia (B.M. No. 1890.6.21.1).
- FIG. 269A. *Sepia latimanus* Quoy & Gaimard: ♀; right tentacular club (T.cl., 65 mm) Fish market, Singapore (B.M. No. 1947.5.16.1).
- FIG. 270. *Sepia australis* Quoy & Gaimard: ♂; right tentacular club (T.cl., 6 mm) from specimen of 55 mm in dorsal mantle-length. Cape Town (B.M. No. 1924.9.9.62-69).
- FIG. 271. *Sepia officinalis vermiculata* Quoy & Gaimard: ♂; left tentacular club (T.cl., 50 mm) from specimen of 148 mm in dorsal mantle-length. Natal (B.M. No. 1924.9.9.41-42).

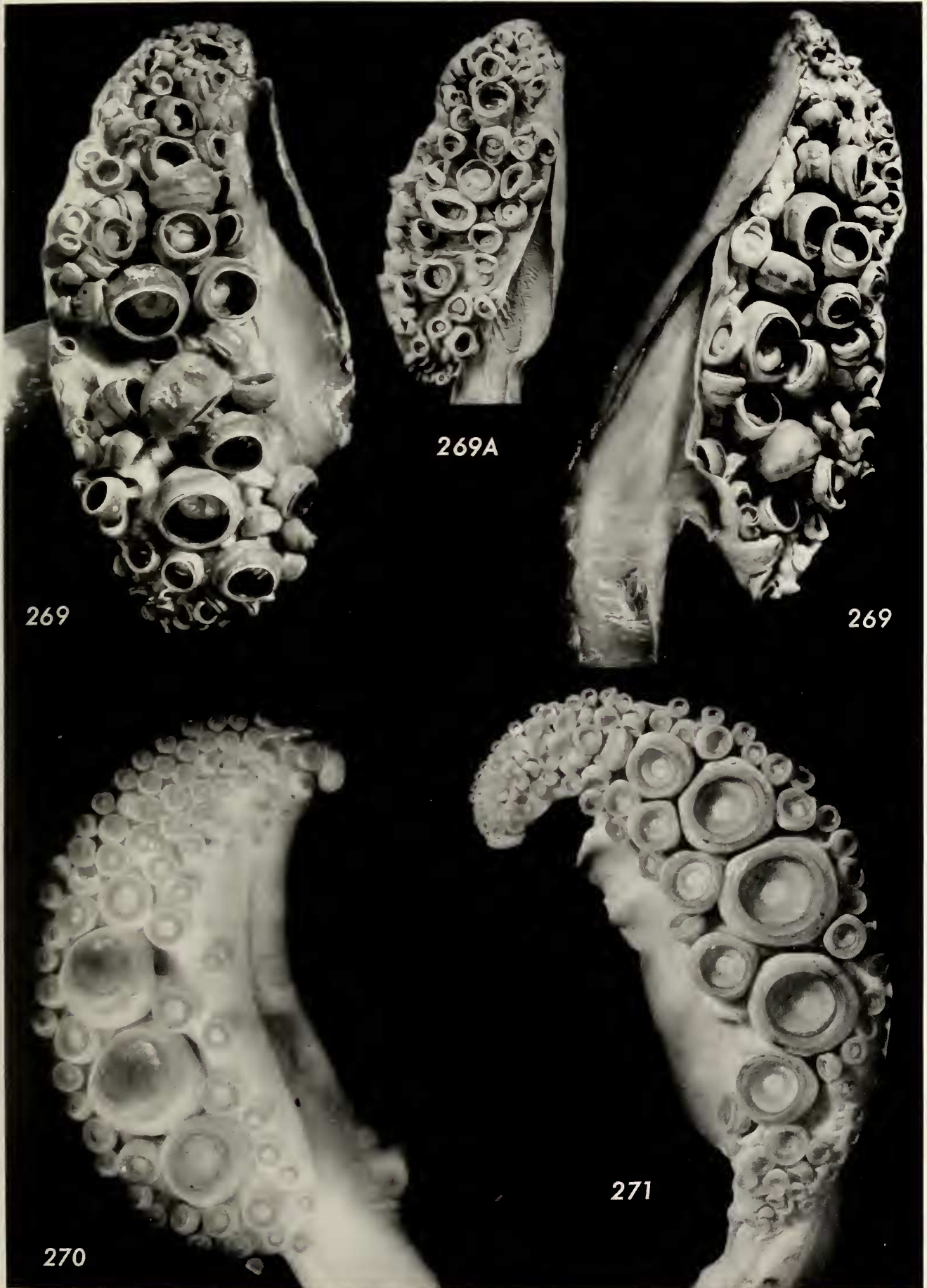


PLATE 46

- FIG. 272. *Sepia (Hemisepius) dubia* sp. nov.: Holotype, ♀; left tentacular club (T.cl., 2 mm) from specimen of 17 mm in dorsal mantle-length. False Bay, South Africa; University of Cape Town Ecological Survey No. F.B. 1007 (B.M. No. 1963103W).
- FIG. 273. *Sepia sewelli* sp. nov.: Holotype, ♀; left tentacular club (T.cl., 3.5 mm). John Murray Expedition, Sta. 27, near Cape Guardafui (B.M. No. 196378W).
- FIG. 274. *Sepia mestus* Gray: right tentacular club (T.cl., 3.5 mm) from specimen of 47 mm in dorsal mantle-length. North China (B.M. No. 1863.5.1.6).
- FIG. 275. *Sepia sulcata* Hoyle: Holotype, ♂; left tentacular club (T.cl., 5 mm) from specimen of 53 mm in dorsal mantle-length. *Challenger* Sta. 192, Arafura Sea (B.M. No. 1889.4.24.77).
- FIG. 276. *Sepia* sp.: juvenile; right tentacular club (T.cl., 3.5 mm) from young specimen of 23.5 mm in dorsal mantle-length. John Murray Expedition, Sta. 27, near Cape Guardafui (B.M. No. 196399W).
- FIG. 277. *Sepia trygonina* (Rochebrune): ♀; left tentacular club (T.cl., 4.5 mm) of specimen of 50 mm in dorsal mantle-length. John Murray Expedition, Sta. 27, near Cape Guardafui (B.M. No. 196388-94W).
- FIG. 278. *Sepia arabica* Massy: ♂; right tentacular club (T.cl., 5 mm) from specimen of 67 mm in dorsal mantle-length. John Murray Expedition, Sta. 194, Gulf of Aden (B.M. No. 196386W).
- FIG. 279. *Sepia robsoni* (Massy): Holotype, ♂; tentacular clubs (T.cl., 2.5 mm) from specimen of 17 mm in dorsal mantle-length. Hout Bay, S. Africa (B.M. No. 1926.10.20.8).



